OPERATING MANAGEMENT'S
OWN MAGAZINE . . .

CHEMICAL PROCESSING

with PROCESS DYNAMICS

MARCH 1961

Should Engineers Be Registered?

Number of certificates up 65% in decade and movement is snowballing 23

5000 Cl_2 Cells Replaced By 200

Cell room shrunk 66% as $6-million program pays out for Pennsalt . . . 72

DETERGENT FOAM *suggests* CHEMICAL OPPORTUNITY

A competitive surfactant easily removed from waste water should find a volume market that still has far to grow . . . Page 25

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Check 2820 opposite last page.

that's interesting

Coat of dye is being applied to the grass in the Philadelphia Stadium.

Why grass is greener in Philadelphia Stadium

If the gridiron in the Philadelphia stadium seemed greener this year when the Army-Navy game was played than the season would seem to justify, Allied Chemical's National Aniline Division experts are willing to take a bow.

The grass was dyed with Allied Chemical's special grass green dyestuff by a 10-man team from the Philadelphia Department of Recreation, so that the gridiron markings would show up much better for both the stadium audiences and television viewers.

The color is so natural that only the team which applied the dye can tell for sure that it was dyed.

Buoyant launch pad urged for nuclear rockets

A buoyant sea base, dubbed PROP (Planetary Rocket Ocean Platform), has been proposed by Aerojet-General Corporation, as a solution to the problem of launching large chemical and nuclear rocket boosters.

The launching platform would be located well above reach of extremely high seas and, supported by an underwater buoyant chamber. Personnel would be evacuated by submarine through an air lock in the subsurface structure.

A central tube in the upper structure beneath the rocket engine is receded and the ocean serves as an effective shield for hot exhaust.

Negative ion generator debuts as health aid

A negative ion generator is being introduced to the American public by United States Radium Corporation, Morristown, N.J., with the hope that it will become as standard an item in the home as the humidifier.

Dubbed the Dynamic Ionaire Mark VII, the compact portable device, weighing less than 5 lb, generates more than a billion negative ions/sec in operation.

Its introduction follows on the heels of findings by medical researchers that negative ions, in sufficient quantity, induce improved ciliary action in the trachea, reduce nose and throat congestion and relieve breathing difficulties.

These and other respiratory conditions are believed to be caused by a preponderance of positive ions in the environment.

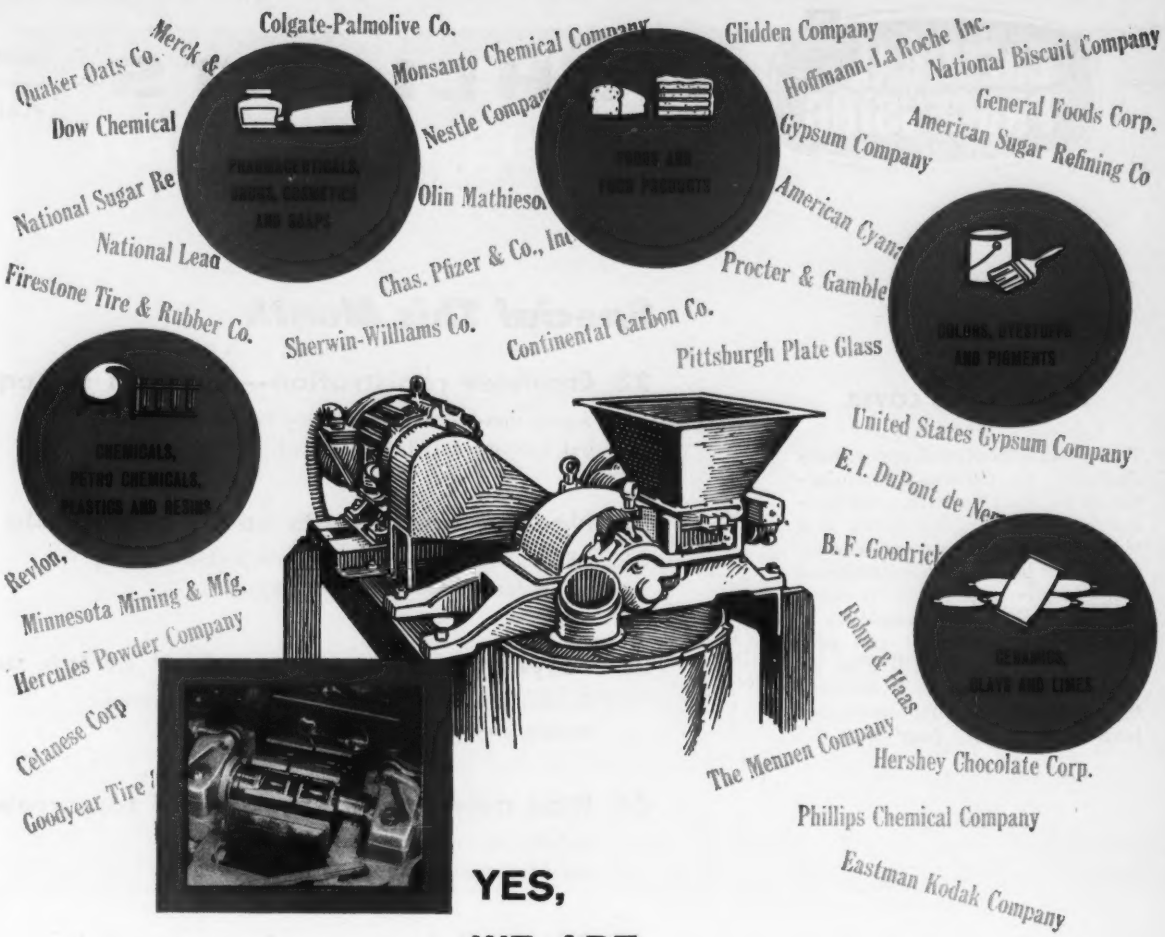
Weak beta emission from tritium sealed in titanium foil produces the negative particles circulated by the Ionaire. The device requires only 15w and can be plugged in standard 110v AC outlet.

Computer 'crated' for trip to Sweden in polyethylene

Transparent polyethylene wrapping served as crating for a 31,500-lb RCA 501 computer when the fragile equipment was air-lifted by DC-7F from New York City to Stockholm.

There were two good reasons for the unorthodox packaging. First the computer and its related equipment weighed the maximum that the plane could handle. Secondly, RCA officials reasoned that the transparent wrapping would enable cargo handlers to see what they were handling and thereby encourage them to exercise due caution.

Just so RCA officials would know how roughly the computer was treated in transit, a table recorder was attached to the console to register every shock or vibration encountered.



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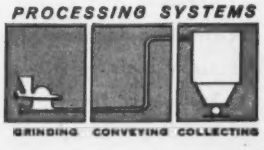

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Check 2821 opposite last page.

CHEMICAL PROCESSING

HIGHLIGHTS

MARCH 1961

VOLUME 24 • NUMBER 3

THIS MONTH'S COVER

There's an exceptional opportunity available to chemical manufacturers to come up with a surface-active agent for detergents that will cause less foam at sewage plants and be more easily removed from waste water. The problem is admittedly controversial . . . but the company that can economically solve it will find its product enthusiastically received by detergent manufacturers. See feature article . . . page 25.

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Former lab curiosity proves versatile building block in organic synthesis

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Space for cell room 66% less as $6-million modernization program pays out

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115 Maintenance tips to help keep conveyors moving

120 Airless mixing, dispensing of 2-component reactants

Operating management's own magazine

CHEMICAL PROCESSING is truly, as noted on the cover, operating management's own magazine. It is that because CP is making an allout effort to provide the men who run chemical processing plants with the well-rounded information they need.

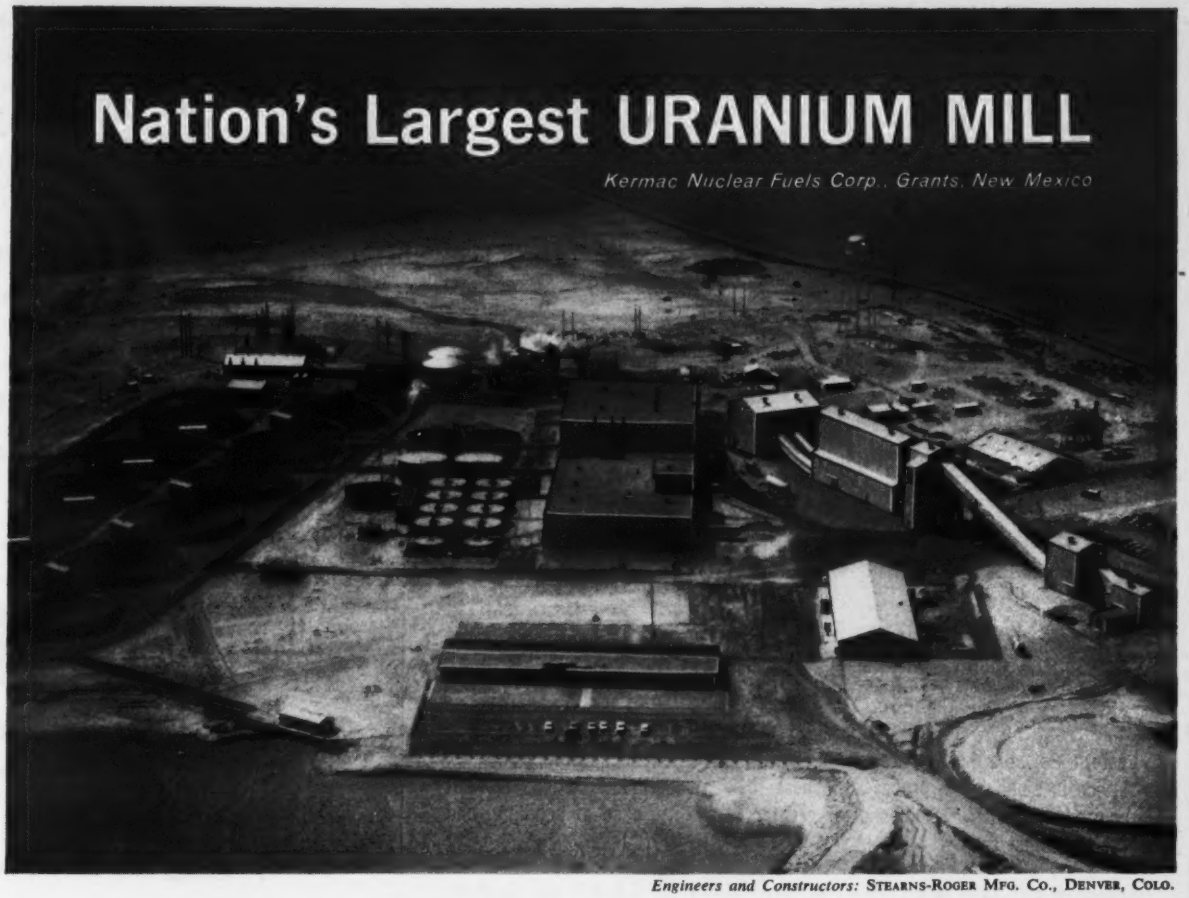
Between the covers of one magazine, the reader will find not only the details of technological advances in processes, equipment and new chemicals that are vital to the operating manager — but also articles on the broader business aspects of the chemical processing industries that are increasingly valuable to a manager as he moves up the ladder.

In order to produce top stories in each of these areas, our editors must of necessity travel widely in visits to plants and offices — interview operating managers in charge — to ascertain the real facts. Many authorities are consulted in efforts to make the information presented accurate and reliable. It means digging deeper to develop a more interpretive story. Various events must be fitted together to complete the jigsaw puzzle that reveals a major development.

As a result, CP is frequently complimented by operating managers as a publication that serves them well. Not that we can't do better! We can and expect to do so. Readers such as you can help with your suggestions. We're always pleased to get your letters. Let us hear from you soon.

Gordon Weyermuller

Associate Editor,
Chemical Business



Engineers and Constructors: STEARNS-ROGER MFG. CO., DENVER, COLO.

Here, uninterrupted functioning of valves is vital to continuous operation ... so JENKINS VALVES were chosen

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In the processing, ore and its many derivative components are put through so many washing operations that the mill might be termed the world's biggest "laundry". The valves controlling the use of plant process water are in continuous service.

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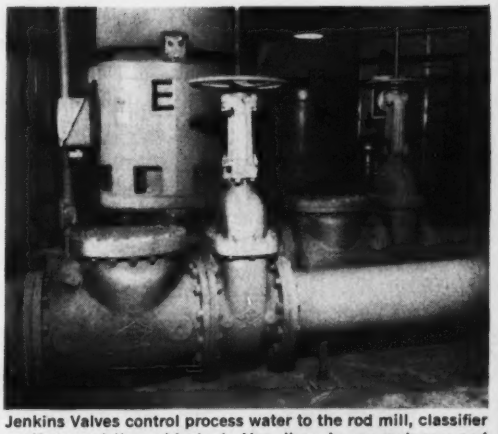

Jenkins Valves control process water to the rod mill, classifier sections and the acid plant. Also, lines in power house and heating system.

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especially designed for small batch processes

offer . . . precise mixing results with long term cost savings

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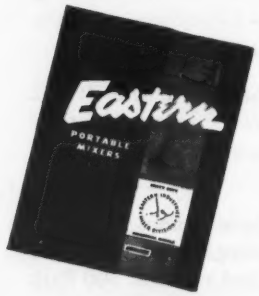
NEW PORTABLE MIXER BULLETIN

Eastern's improved line is included in the revised Portable Bulletin No. 530-A.



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MIXER DIVISION
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East Norwalk, Conn.

Check 2823 opposite last page.

CHEMICAL PROCESSING

MARCH 1961
VOLUME 24 • NUMBER 3

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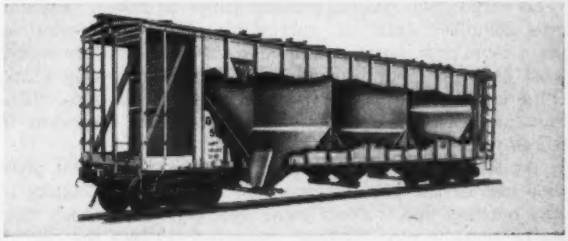
Illustrated is a schematic view of the new, exclusive General American unloading nozzle Unloading flow can be controlled to accommodate individual unloading systems. Three outlets are provided on each car, thus requiring fewer connections and adjustments, minimizing the possibility of contamination.

275 of these cars are already in service or on order. If you would like further information on the Dry-Flo Chem Car, write to . . .



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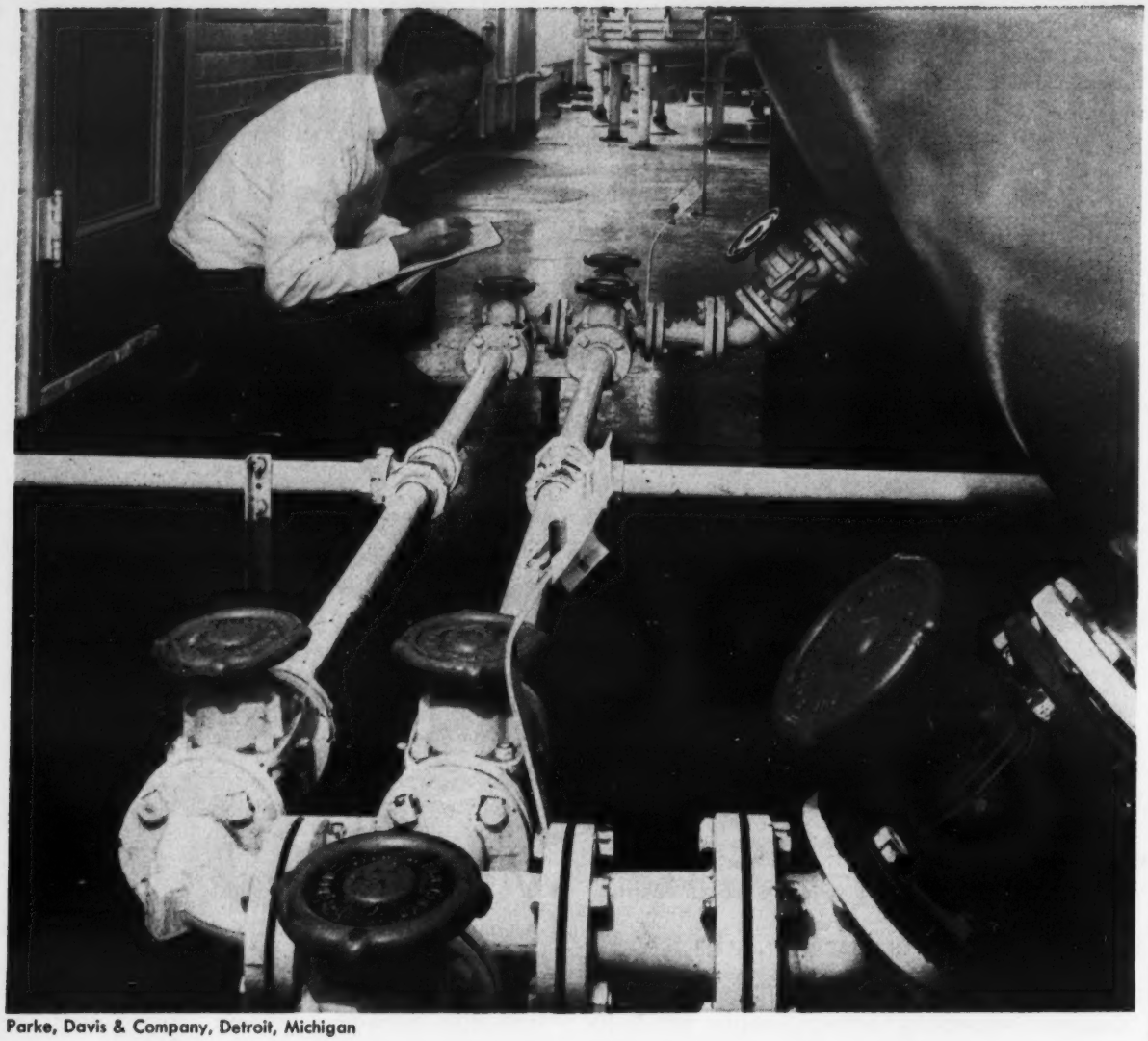

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The cargo: 3% pharmaceutical-grade hydrogen peroxide and deionized water . . . carried by a 300-foot pipeline, at floor level near heavy-traffic areas. Pipeline failure would cost $500 per hour in production downtime. Saran Lined Pipe keeps this reactive material prescription-pure, without one case of breakage or failure from corrosion in three years' service!

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THE DOW CHEMICAL COMPANY DOW Midland, Michigan

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CHEM-TRENDS / Our Growing Industry

Four projects to boost benzene capacity by 100 million gal/yr

Benzene production capacity will be boosted by more than 100 million gal/yr as a result of three recently-announced projects and a fourth currently nearing completion.

The three newly-unveiled projects are slated for booming southeast Texas while the fourth involves three scattered refineries, one of which is located at Houston, heart of the growing petrochemical center.

Benzene (42 million gal/yr) is only a minor aspect of the biggest project — that of **Monsanto Chemical Company** which is moving toward self-sufficiency in hydrocarbon raw materials for its chemical processes.

Monsanto has purchased a 3000-acre site at Chocolate Bayou, Texas, south of Houton and west of Texas City, where it plans to build a 500-million-lb/yr ethylene plant, occupying 550 acres. This plant, scheduled for operation in 1962, will also produce the aforementioned benzene, 50 million lb/yr of naphthalene, plus propylene, cumene, phenol, acetone, ethyl benzene and other hydrocarbons used by Monsanto in manufacture of plastics and organic chemicals.

A major portion of the Chocolate Bayou ethylene output will go to Monsanto's Texas City plant 25 miles away. The two plants are expected to be linked by pipeline.

At least 50 million lb/yr of phenol will be manufactured by a cumene-oxidation process in a unit which the company announced last September it would construct in Texas. Addition of this unit will boost Monsanto's total phenol capacity to over 200

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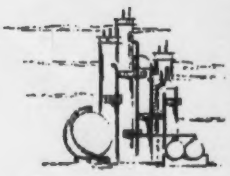

Cryogenic gas-processing expansion looms as He-conservation program takes shape

Dilemma of achieving moderate-cost recovery of half to two-thirds the helium lost in natural gas, while still maintaining the traditionally lower cost processing of helium-rich gas, may be resolved. At least this is the intention behind the 1960 conservation amendments to the Helium Act and the responsibility of the five-man Bureau of Mines board making necessary studies and decisions.

According to the law, effective March 1st, the board is considering proposals from private industry which is to be authorized to build plants commensurate with conservation goals. Crude (50-80%) helium product is to be purchased by the Bureau, stored, and ultimately refined and sold.

Big problem with extraction plants is to economically chill to cryogenic temperatures tremendous volumes of He-bearing natural gas — principally from Panhandle and Hugoton fields of Texas, Kansas and Oklahoma — to permit He content to be extracted. Inasmuch as such big-scale thermal processing of gas is still in the conjectural design stage, optimization of various capital outlays versus corresponding operating costs is part of the board's problem.

But perhaps the bigger problem is financing the inventory which would be accumulated in the Bureau's depleted Cliffside gas field near Amarillo, Texas. Annual purchases from producers (at $10-20/M cu ft) may run $30-60 million annually, foreseeably accumulating to $1 billion in 20-30 years. Where is the money to come from? Some say the Bureau favors increasing the selling price of purified He to include the cost of inventory investment. But there is fear this would drive inert-gas users to argon or other inerts, further compounding the storage problem.

With such big-scale facilities, big sums of money, and critical national conservation policies involved, all problems are not apt to be resolved at once. But the new Administration is thought to favor vigorous conservation, and so the related processing and financing should follow . . . perhaps stepwise. In the meantime helium losses continue — 3 billion cu ft/yr! ■

Russian Notes

Soviets are making major effort towards factories designed for automation, says Martin Co. panel study. They are predicted to move faster than U.S. in applying mathematical theories to automation. Reason: Better communication. While one group works on a general theory of control, another group of mathematical engineers works with them on applications. Employment at Automation Institute at Kiev is to grow in three years from 2000 to 7-10,000 — a significant symptom.

Another group (society) of mathematicians meeting recently in Washington believes the **Soviets are losing their traditional leadership in theoretical mathematics** because of emphasis on applied research.

Du Pont and IBM study dynamic control of acrylonitrile process

What is Du Pont doing with respect to dynamic computer-control of chemical processes? Now, at least one answer is out. With IBM, Du Pont is studying its acrylonitrile process (based on propylene, ammonia and air) at its Repauno Development Laboratory, Gibbstown, N.J., and at IBM's Research Center at Yorktown Heights, N.Y. A computer-controlled chemical reactor is expected to be in operation at Gibbstown by fall of 1961.

The acrylonitrile process presents a serious challenge to computer control because high efficiency of catalyst is sensitive to operating conditions. Reaction is time-varying, nonlinear system; given inputs of energy and material do not produce the same outputs each time.

Research has shown that significant improvement in the process is possible only by very rapid and precise adjustments accomplished through dynamic computer control. So methods of dynamic optimization — constantly approaching best operating condition — must be developed. To permit this, advanced mathematical control schemes have been devised to track process behavior at all times.

In actual control of process, digital computer will be tied directly to process through composition-monitoring instruments, along with temperature, pressure and flow information. With advanced catalyst used, even minor control error or delay could lead to formation of unwanted by-products and measurable economic losses.

A major economic advantage is expected once computer-directed **dynamic** control is perfected for commercial operation. ■

And in brief . . .

Direct hydrogenation of copper oxides by Chemetals process used for nickel by Sherritt-Gordon will be basis for Foster-Wheeler-designed Philippines plant . . . Five-U.S.-firm consortium will build $70-million **petrochemical complex** in Argentina . . . South America's **carbon black** will be increased 40% by United Carbon's Venezuela plant . . . Penn State has established **"solid state" interdisciplinary curriculum.**

Hercules and Stauffer report 1960 **capital expenditures at all time high,** $59 and $31 million, respectively . . . NSF grants will send 357 undergrads to **summer research** under scientists . . . Senate committee pegs industrial & municipal **sewage plant needs** at $42 billion over next 20 years . . . Olin-Mathieson's president urges an International Guaranty Bank to **insure overseas industrial investments** against political risk of cold war . . . Industry spent **$600 million more** in 1960 for R&D, says NSF.

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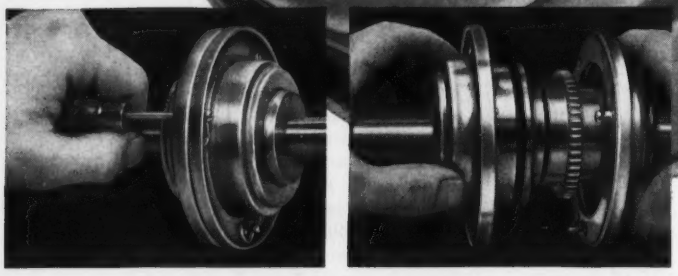

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Check 2826 opposite last page.

OUR GROWING INDUSTRY

From page 8

million pounds a year.

Shell Oil Company has enlarged benzene production facilities at three refineries to provide a total capacity of more than 60,000,000 gal — more than three times the former capacity. The refineries are at Wilmington, Calif.; Houston, Texas; and Wood River, Ill.

Production capacity of benzene and toluene will be virtually doubled by expansion planned at the Baytown, Texas, refinery of **The Enjay Chemical Company,** division of Humble Oil & Refining Company.

Humble's total capacity will be increased to about 80 million gal/yr when the expanded facilities go into operation at Baytown early in 1962. Benzene output will be boosted from 30- to-55-million-gal/yr while toluene capacity will climb from 32- to 55-million gal/yr.

The Atlantic Refining Company and the **Pure Oil Company** will construct an aromatics manufacturing unit this year at Pure's Nederland, Texas, refinery. Atlantic, operator of a refinery at Port Arthur, Texas, will own 50% of the Nederland installation.

To be constructed by **M. W. Kellogg Company,** the unit will produce benzene as the primary product, supplemented by production of toluene and xylene. Scheduled for completion in December, 1961, it will have a capacity of 50 million gal/yr of aromatics.

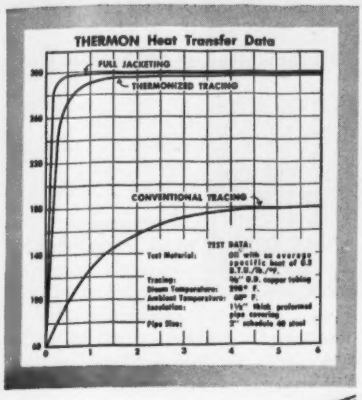
Also slated for southeast Texas is a multi-million-dollar petrochemical plant to

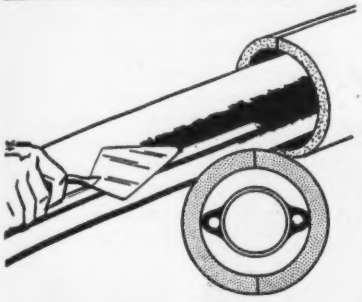
CORRECTION

Value of Dow Chemical Company stock exchanged for Allied Laboratories, Inc., stock under the transaction by which Dow acquired Allied was approximately $40 million, not $400,000 as reported on page 8 of our February issue.

THERMON

the proved solution to HEAT TRANSFER problems





Wherever heat transfer is a problem, non-metallic, adhesive Thermon Heat Transfer Cement, with its highly efficient heat transfer properties, usually can effect a solution. Approximately 5,000 different users, with hundreds of applications, have realized savings of up to 90% with Thermon.

Thermon can easily be applied over both steam tracing and electrical resistance systems, and is equally effective for heating and cooling operations.

Thermon's heat transfer characteristics are approximately *11 times* superior to those of steam tracing, and almost equal those of steam jacketing. Almost without exception, Thermon can be used in place of expensive steam jacketing—and can often be applied where steam jacketing is impossible. Up to 90% of the cost of steam jacketed equipment has been saved through use of Thermon.

Write for Thermon Bulletin 300.

THERMON
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Check 2827 opposite last page.

be built by **Tennessee Gas Transmission Company** on its 794-acre site along the Houston Ship Channel. The facilities will consist of two units, one capable of producing 100 million lb/yr of acetylene from methane; and the other for converting most of acetylene into vinyl chloride monomer.

The VCM will be shipped to **Cary Chemicals, Inc.,** with which Tennessee Gas has formed a long-term production and marketing association. Under the arrangement Cary continues as an independent corporation, but Tennessee Gas will own a substantial interest.

Cary will have an equity in the Houston plant which is scheduled for completion next year. Cary is also expanding its vinyl polymer, compounding and calendering facilities.

Eastman Kodak Company plans to invest about $70 million during 1961 for additions, replacements, and improvements in its U.S. facilities. Of the $70 million $34 million will go to Rochester facilities; $30 million for Tennessee Eastman and Texas Eastman divisions; and the remaining $6 million for sales, distribution and processing units.

Hercules Powder Company is constructing a second multi-million-dollar polyolefins unit at Lake Charles, La.—doubling the size of the plant recently placed on stream there. The first unit has 60-million-lb/yr capacity and was designed for ultimate capacity exceeding 100 million lb/yr. Total capacity ultimately will amount to 200 million lb/yr, with 80 million lb/yr coming from Parlin, N.J.

The Chemstrand Corporation became wholly-owned subsidiary of **Monsanto Chemical Company** with acquisition by Monsanto of **American Viscose Corporation's** interest in Chemstrand. Chemstrand, formed as a joint venture in 1949 by Monsanto and Viscose, is the nation's second largest producer of nylon and acrylic fibers.

IN CORROSION RESISTANT PROCESSING EQUIPMENT
The Name for Quality is LEE
Style A Kettle ½ Jacketed, 5 to 500 gal.
Style CW Kettle ½ Jacketed, 80 to 300 gal.
Style B Kettle Full Jacketed, 10 to 300 gal.
Style CW3T Kettle with Center-Line Scraper Agitator, 80 to 300 gal.
Style C Kettle ½ Jacketed, 5 to 100 gal.
Pressure Kettle ½ Jacketed, 40 to 200 gal.
Storage Tank 100 to 5,000 gal.
Pulp Tank 500 to 2,000 gal.
Vacuum Pan 10 to 500 gal.
Quick Cooling Pan 50 to 200 gal.
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Interested in modifications of standard units or custom-designed equipment? Our facilities are such that we can make any special designed units you may require. Write us.
WRITE for bulletins on any of the products illustrated.
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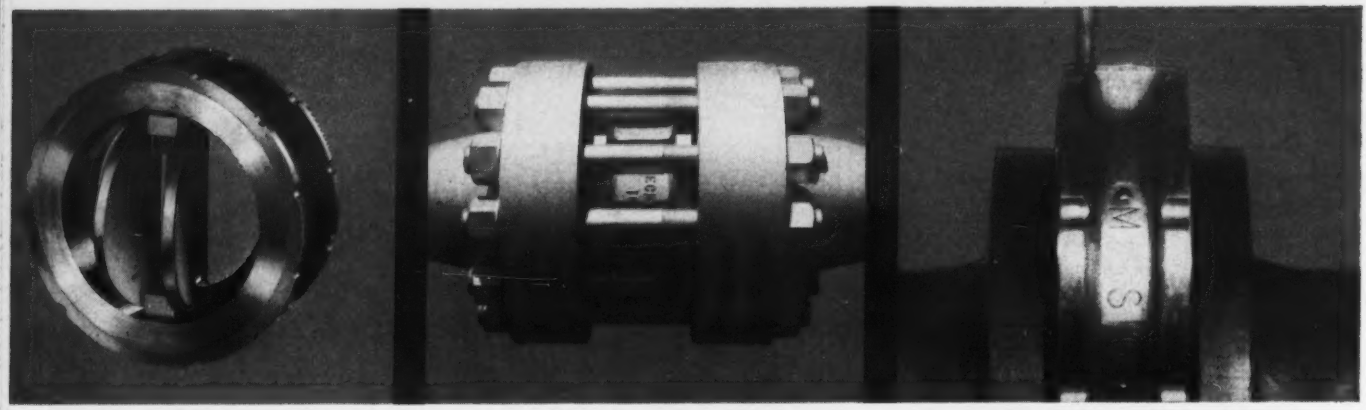
COSTS LESS—WEIGHS LESS—EASY TO INSTALL

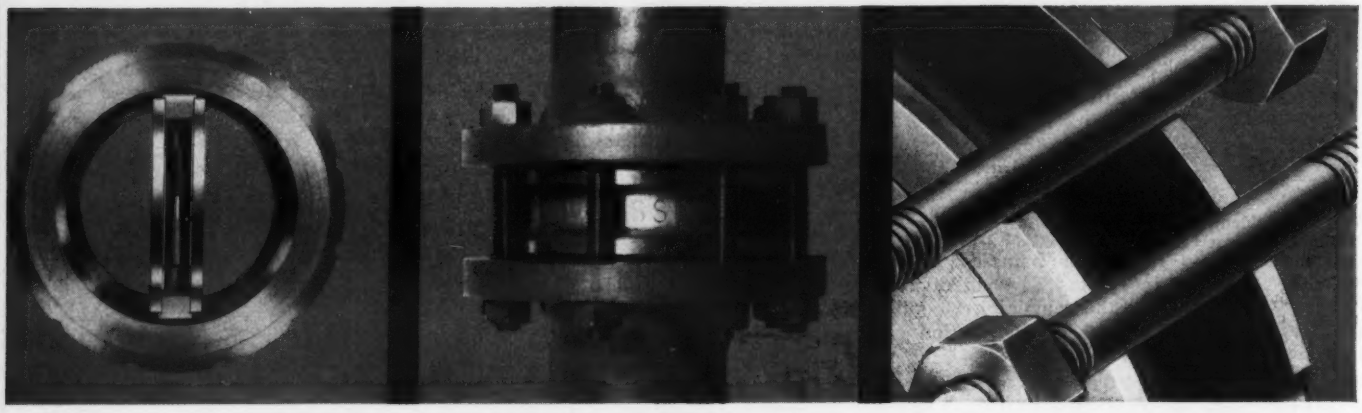


Because of its sound, imaginative design, the Duo-Chek check valve is smaller, uses less material, and costs less to buy. It costs less to maintain and lasts longer, too.

A Duo-Chek check valve weighs on the average less than ten per cent, with some models weighing only two per cent, as much as conventional check valves for the same service. No foundations are needed.

The Duo-Chek fits between the flanges, is smaller and weighs less. For example, a 6-inch steel valve, series 300, weighs 29 lbs., requires no special installation equipment.

NO SLAM—ANY POSITION—CUTS INVENTORY



A stainless steel coil spring effects positive sealing action. The quick action of the spring closes the valve before reverse flow can occur. Result: No slam, no water hammer.

The Duo-Chek simplifies piping arrangements. The spring loaded plates operate in any position. Most popular sizes can be installed even in vertical lines with downward flow.

The unique versatility of the Duo-Chek greatly reduces inventory. In sizes 2 through 12 inch, one valve fits both series 150 and 300 flanges; 2- and 3-inch sizes fit series 600, too.

MISSION **DUO-CHEK** CHECK VALVE

The Mission Duo-Chek® check valve performs all regular check valve duties, yet is smaller, lighter, and easier to install. Duo-Chek check valves are available in a complete range of sizes from 2 to 48 inches, ASA Series 125 through 2500. They come in various end connections, such as raised face, ring joint, weld neck, etc. They are made in carbon steel, stainless steel, aluminum, and bronze. Special alloys are available. Because of the small size of the Duo-Chek, special alloy valves cost much less than conventional valves in the same alloy.

Sealing material is bonded in a groove in the plate. The sealing material makes an O-ring seal, which pressure deforms until metal-to-metal contact is made by the plate and body seat. Sealing material may be Buna-N, Teflon, Viton, or metal, depending on the service.

The simplicity of design of the Duo-Chek pays off in every installation with longer life and less maintenance. Only six parts are contained within the body of the Duo-Chek, held without the use of internal fasteners or joints of any kind. All parts are interchangeable.

The Duo-Chek is much lighter in weight than conventional check valves, yet is stronger. By dividing the opening, the unsupported plate area is reduced so that each plate requires only one-eighth of the weight of a conventional clapper of the same strength. The short stocky body is inherently stronger and more rigid than a short length of heavy wall pipe.

Whatever your check valve application, the Mission Duo-Chek can cut initial purchase and installation costs, cut maintenance costs from then on. Contact Mission now for a representative.

MISSION VALVE AND PUMP CO. A SUBSIDIARY OF MISSION MANUFACTURING CO. P. O. Box 4209, Houston, Texas • Cable Address 'MISSCO' • Export Office: 30 Rockefeller Plaza, New York • In the United Kingdom: MISSION MANUFACTURING CO., LTD., 1 Hanover Square, London W. 1 England • Cable Address 'MISSOMAN' • Sold by Mission Manufacturing Company outside of Canada and the U.S.A.

MISSION VALVE AND PUMP CO.

Check 2829 opposite last page.

Spotlight On People

White named chairman of Texas, Tennessee Eastman divisions

James C. White has become chairman of Tennessee Eastman Company and of Texas Eastman Company, divisions of Eastman Kodak Company at Kingsport, Tenn., and Longview, Texas.

A director and recently-named member of the executive committee of Eastman Kodak, he has been president and general manager of Tennessee Eastman since 1945, and president of Texas Eastman since 1953. In addition, he is chairman of Eastman Chemical Products, Inc., of Holston Defense Corporation, and of Holston Trading Corporation, all Kingsport headquartered units.

Dr. Louis K. Eilers succeeds White as president of Tennessee Eastman and also of Texas Eastman, and **Harry D. McNeeley** moves up to executive vice president of Texas Eastman, while retaining his position of executive vice president of Tennessee Eastman.

White

Logan

In one of a series of appointments announced by Olin Mathieson Chemical Corporation, **John O. Logan** was named general manager of the Chemicals Division, succeeding the late Edward Block as head of the largest of the corporation's six operating divisions.

Edwin B. Lopker was named to the newly created position of vice president, engineering, for the Chemicals Division. He is succeeded as vice president and manager of the division's Blockson operations by **William Block. B. N. Schrauf** becomes director of marketing for the organic chemicals operation of the corporation.

N. Harvey Collisson, president of the Ormet Corporation, jointly owned by Olin Mathieson and Revere Copper and Brass Incorporated, announces appointment of **Gene E. Zinniger,** executive vice president, and **John J. Miller,** general manager of the reduction division.

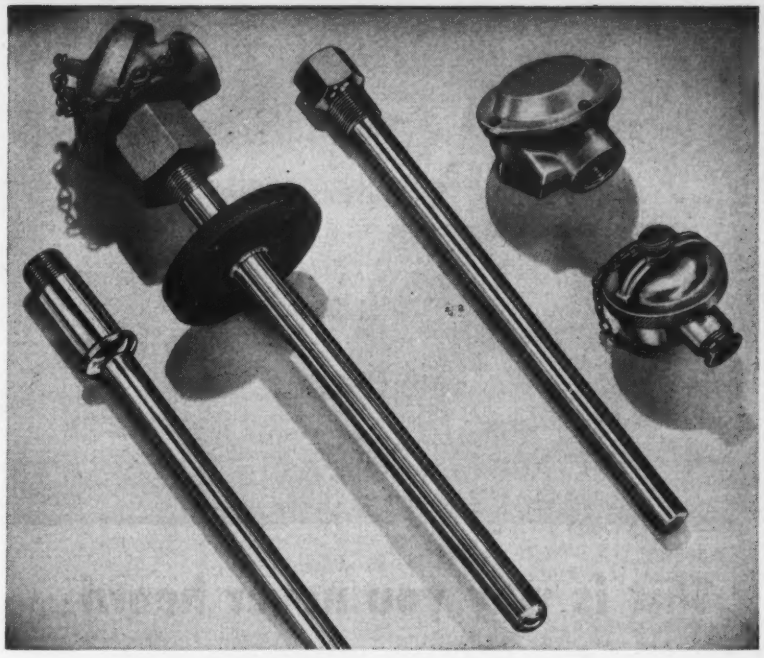
Maynard P. Venema succeeds **David W. Harris,** as chairman and chief executive officer of Universal Oil Products Company. Venema takes over the helm of UOP at a time when the company, traditionally a developer and licensor of petroleum refining processes, is expanding into specialized chemical and industrial areas. Harris continues as a member of the board and chairman of its finance committee and will serve as special advisor to Venema.

Ault

Venema

Bromwell Ault has been elected vice-chairman of the board of Interchemical Corporation and **William N. Davies** and **Kenneth B. Lane** have been named vice presidents.

Moving up in UBS Chemical Company, division of A. E. Staley Manufacturing Company, are **Dr. Lloyd H. Perry** appointed vice presi-



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Thermo Electric's base metal thermocouple assemblies give consistently reliable temperature readings for ranges between —300°F. and +2200°F. We specialize in solving problems caused by chemical attack, pressure and installation difficulties . . . and offer the most complete variety of standard thermocouple assemblies in the industry. See our new 16 page catalog for the many types available.

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Single and multiple junction thermocouples are made of all standard thermocouple materials and gage sizes. Ceramic insulated, metal sheathed "Ceramo-Couples" are used most effectively for extended life at high temperatures or for sub-zero conditions where condensation is a problem. These temperature sensing elements have excellent resistance to moisture, petroleum products, chemical action and abrasion, and are often used without additional protection tubes. The wires used in all these thermocouples are drawn, annealed, insulated and calibrated in our own wire mill under Thermo Electric's high standards for mechanical and thermoelectric qualities.

Thermowells

The selection of over 5700 standard Thermowells includes bar stock or built-up construction, test wells and extra sensitive wells; and a variety of mounting fittings and flanges. Many construction materials available—all wells are pressure tested.

Connection Heads

Choose from six different types, including heavy duty cast iron heads, lightweight aluminum heads, and quick-opening heads. All weather proof—many sizes.

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Our Thermocouple Catalog has complete information, simplified ordering instructions for all assemblies and components, and a Thermowell Material Guide for hundreds of industrial applications.

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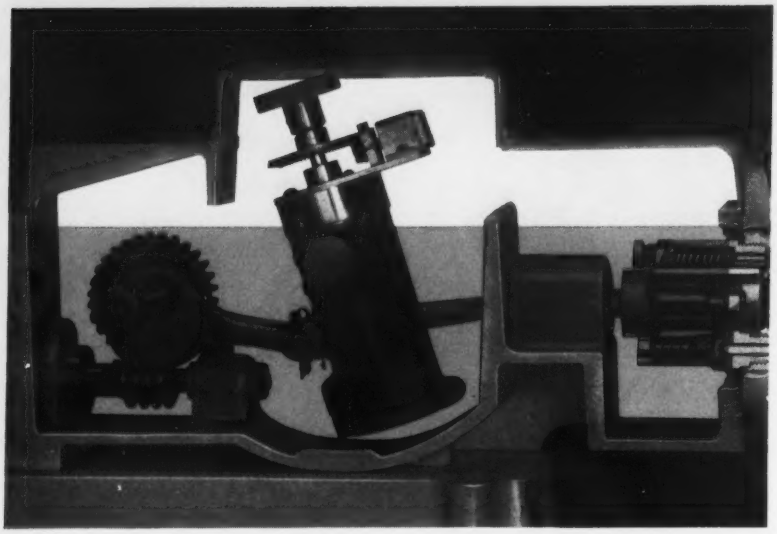

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Lapp

***WRITE** for Catalog 59. Lapp Insulator Co., Inc., Process Equipment Division, 1316 Poplar Street, LeRoy, N. Y.*

Check 2831 opposite last page.

PEOPLE

dent and technical director, and **John C. Smith,** vice president and director of marketing and sales.

Raymond R. Herrmann Jr., assumes corporate-level responsibilities as vice president of National Distillers and Chemical Corporation, while continuing as vice president and assistant general manager of National Distillers Products Company.

Three new divisions have been formed by Borden Chemical Company to meet needs of company growth and expanded areas of market activity. Heading the divisions as vice presidents are: Adhesives & Chemicals Division, **Raymond J. Lodge,** formerly general manager of the Resins & Chemicals Department; Western Operations Division, **Ray T. Hanson,** formerly general manager of the Western Operations Department; and Thermoplastics Division, **Harry C. Wechsler,** formerly vice president for commercial development.

A new corporate purchasing function for The Dow Chemical Company has been established with **David D. Baird** as director of purchases. Baird will report to Carl A. Gerstacker, chairman of Dow's board. Baird has been assistant secretary and assistant treasurer since last June.

Columbia-Southern Chemical Corporation, wholly-owned subsidiary, has become a division of Pittsburgh Plate Glass Company. Principal officers of Columbia-Southern, now known as Pittsburgh Plate Glass Company, Chemical Division, have been elected as officers of the parent company. They are **Joseph A. Neubauer,** vice president and general manager, Chemical Division, and **Chris F. Bingham,** vice president chemical sales. Chemical Division products will continue to be marketed under the "Columbia-Southern Chemicals" imprint.

ANOTHER NEW ACHIEVEMENT IN MODERN FLOW CONTROL BY CRANE

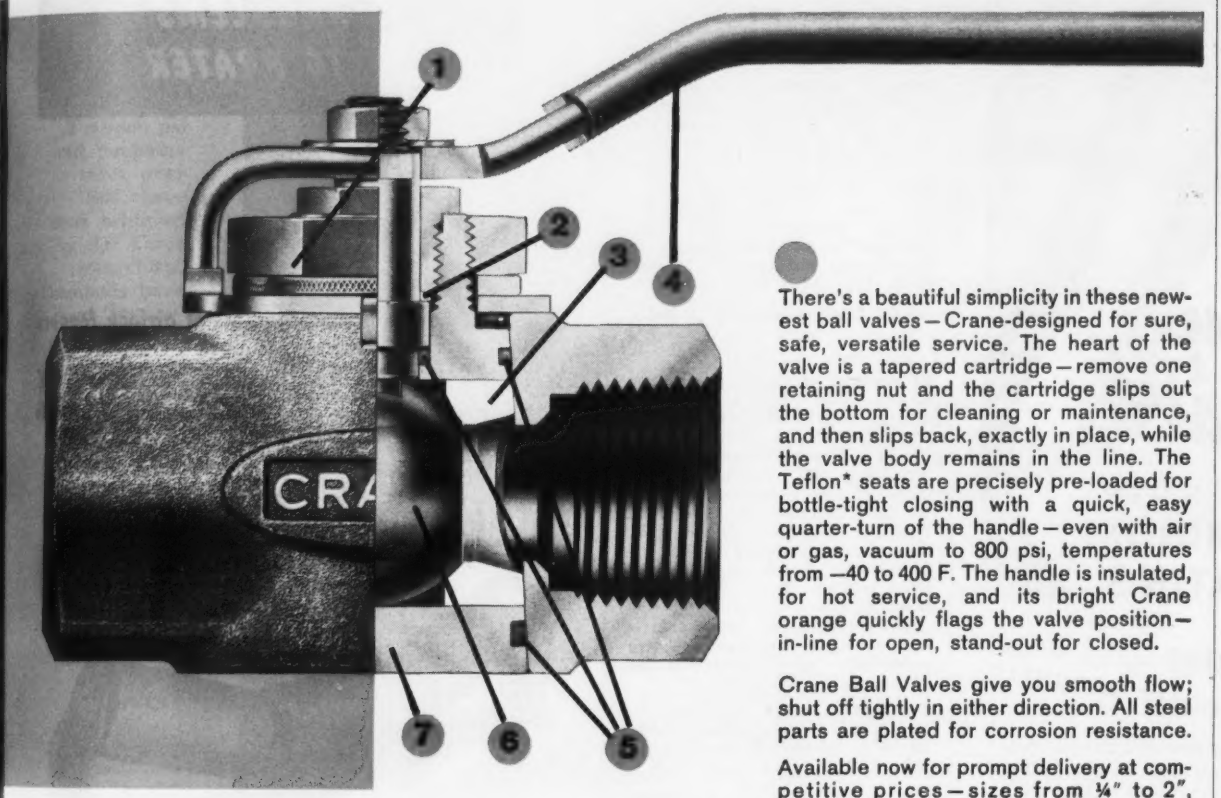
1. Single retaining nut holds cartridge assembly in body, for fast, foolproof dismantling and assembly
2. Teflon* thrust washer reduces stem friction; absorbs line pressure load on ball
3. Teflon* seats pre-loaded for tight shut-off with minimum torque
4. Bright plastic grip insulates handle and flags valve position
5. Positive, Standard Size O-ring seals on stem, cartridge
6. Self-aligning, precision-machined ball, polished and chrome-plated to minimize friction and wear on seats.
7. Tapered cartridge contains all working parts; slips out bottom in one piece for cleaning or maintenance

* Teflon is a registered trademark of E.I. DuPont de Nemours & Co., Inc.

CRANE BALL VALVES

with the exclusive tapered cartridge that drops out for fast, in-line servicing

engineered for corrosion resistance plus tight shutoff



There's a beautiful simplicity in these newest ball valves—Crane-designed for sure, safe, versatile service. The heart of the valve is a tapered cartridge—remove one retaining nut and the cartridge slips out the bottom for cleaning or maintenance, and then slips back, exactly in place, while the valve body remains in the line. The Teflon* seats are precisely pre-loaded for bottle-tight closing with a quick, easy quarter-turn of the handle—even with air or gas, vacuum to 800 psi, temperatures from —40 to 400 F. The handle is insulated, for hot service, and its bright Crane orange quickly flags the valve position—in-line for open, stand-out for closed.

Crane Ball Valves give you smooth flow; shut off tightly in either direction. All steel parts are plated for corrosion resistance.

Available now for prompt delivery at competitive prices—sizes from ¼" to 2", screwed ends, in bronze, steel and Type 316 stainless.

Call your Crane Distributor or send today for a complete, illustrated folder on the outstanding new Crane Ball Valves, engineered for unmatched service.

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Valves/Electronic Controls/Piping/Plumbing/Heating/Air Conditioning

Check 2832 opposite last page.

recent books

So You Want to Go Into Industry

Reviewed by
HARVEY R. RUSSELL
Manager of Education Services
American Cyanamid Company

Chemical executives are likely to find this 160-page book a handy tool for guiding the great numbers of young people who come to them for information and advice on careers in the industry. The author, Dr. Edward Hodnett of Dow Corning Corporation, is writing for the college student or upper high school student who has little idea of how industry is organized or what purposes it serves.

In this respect the book serves a need, for there is relatively little vocational information which covers this particular point. Most of the vocational literature is designed — quite properly — for the earlier adolescent who needs to know what people in the industry do, and what the requirements and emoluments are (in general terms). Dr. Hodnett picks up the story in a pleasant style and with plausible theoretical examples.

The book is not a sales piece for industry, yet it presents this aspect of modern life favorably. Of particular interest to business executives is the last chapter, dealing in a straightforward manner with the role of corporations in society and some reservations young people frequently have about industry. Favorable factors often overlooked are pointed out.

To obtain "So You Want to Go Into Industry," remit $3.00 *direct to Harper & Bros.,* 49 *E.* 33*rd St., New York* 16, *N.Y.*

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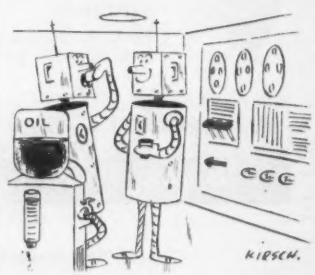

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*Patent Pending

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ROCKWELL-STANDARD CORPORATION
Grating Division, Gary, Indiana

Check 2833 opposite last page.

RECENT BOOKS

Information on the physical methods used by chemists, physicochemists, physicists, biologists and other research workers in dealing with organic chemical problems is partially treated in "Physical Methods of Organic Chemistry, Third Edition, Part III." This book covers Chapters 28 through 39 and is the third of a proposed four-part first volume to a general series containing 10 volumes on Technique of Organic Chemistry.

This series in general is a plan to relieve the chemist of the burden of searching through periodicals and specialized books to acquaint himself with certain physical methods. The object of the authors has been to provide description of tested methods, the theoretical background for understanding and handling them, and the information necessary for a critical evaluation of the experimental results.

To obtain "Physical Methods of Organic Chemistry, Volume 1, Part III," remit $24.50 direct to Interscience Publishers, Inc., 250 Fifth Ave., New York 1, N.Y.

Check 2834 opposite last page.

Proceedings of the Conference on Boron, held September 18-19, 1959 at Asbury Park, New Jersey are presented in this 189-paged book titled, "Boron-Synthesis, Structure, and Properties." Because of the limitations imposed on the conference, the book deals almost exclusively with the solid-state physics and chemistry aspects of elemental boron and closely related borides. There is no treatment of boron chemistry in general or with boron and boride in relation to high-energy fuels or propellants, or with nuclear applications.

To obtain "Boron — Synthesis, Structure, and Properties," remit $8.50 to Plenum Press, Inc., 227 West 17th St., New York 11, N.Y.

Check 2835 opposite last page.

A group of organic reactions important in synthetic organic chemical research are presented to help the researcher, or student, discover the optimum conditions for their application. "Organic Reactions Volume XI" discusses the following reactions in detail: The Beckmann Rearrangement; The Demjanov and Tiffeneau-Demjanov Ring Expansions; Arylation of Unsaturated Compounds by Diazonium Salts; The Favorskii Rearrangement of Haloketones; and Olefins from Amines — The Hofmann Elimination Reaction and Amine Oxide Pyrolysis. An author and chapter index for Volumes 1-11 is included.

To obtain "Organic Reactions Volume XI" remit $12.00 direct to John Wiley & Sons, Inc., 440 Park Ave., S., New York 16, N. Y.

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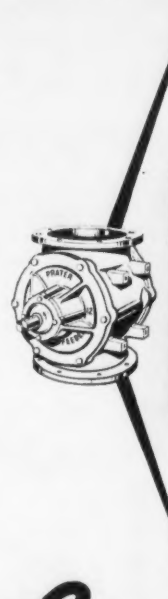
PRATER ROTARY AIRLOCKS



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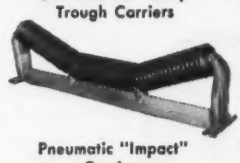

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THAT'S INTERESTING

High-psi artists

Strange new substances are being created from ordinary materials by scientists working with ultra-high pressures and high temperatures. Pressures of 2 million psi and temperatures over 3000° have been achieved by Air Force researchists. Diamonds have been "grown" from graphite at 1,249,500 psi and 1600°C. Two new materials, a cubic form of boron nitride and a very dense form of silicon dioxide, have been created.

Fish-kills traced

Agricultural pesticides and industrial wastes were (blamed for 70%) of 185 pollution-caused fish-kills along 600 miles of streams and 5000 acres of lakes covered by a federal-state study from June to October.

For more information on product at right, specify 2839 see information request blank opposite last page.

Like you, George Chinn is a perfectionist

As K & M's Chief Engineer, George Chinn might be expected to be at least somewhat biased in his opinion of the valves we make. He isn't. Ask him about our products and he'll tell you that they're "not bad".

For George, this is saying quite a lot. We doubt if any customer could be as critical. In fact, if you were to watch him midwifing a prototype run-through on the test loop, you'd probably wonder if he weren't secretly in the pay of a competitor, so diligently does he poke around looking for something wrong. And with twenty-five years of valve engineering behind him, he knows just where to look, too.

More often than not, he finds a few unsuspected bugs. When he does, we are, honestly, almost glad. Not that we enjoy headaches or have anything against showing a profit. It's just that we'd rather find the flaws, if any exist, than have our customers find them. Makes sense, doesn't it?

diaphragm control valves

K&M

KIELEY & MUELLER, INCORPORATED

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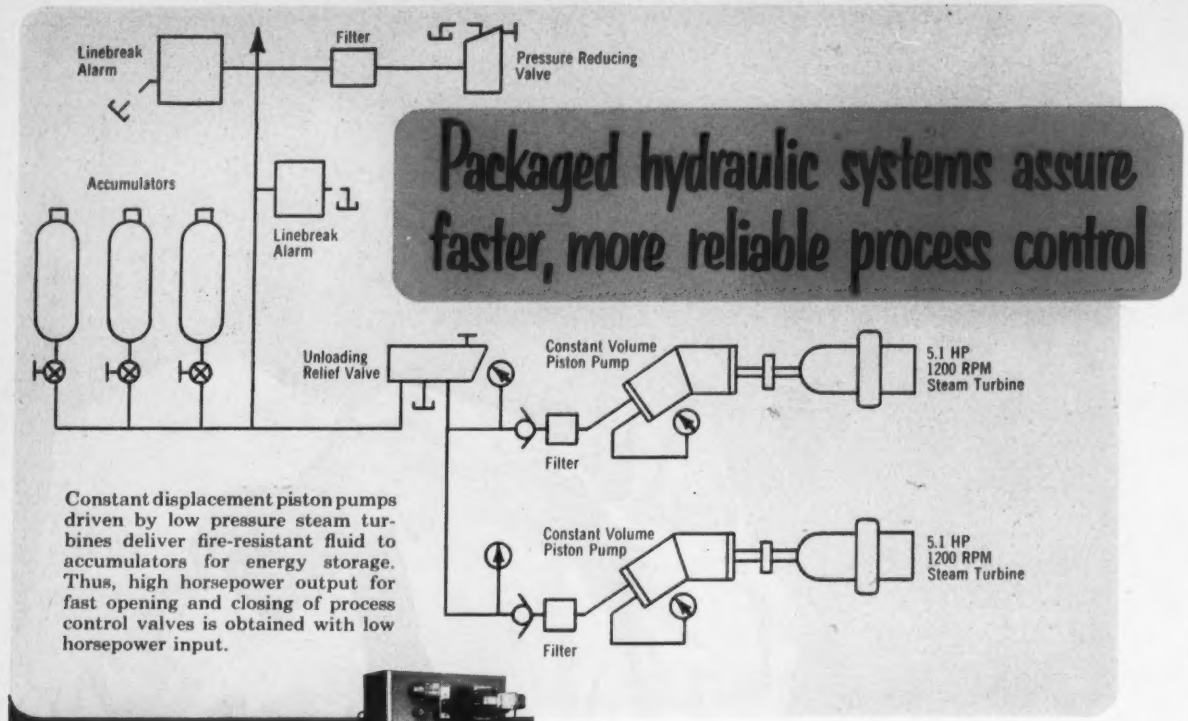
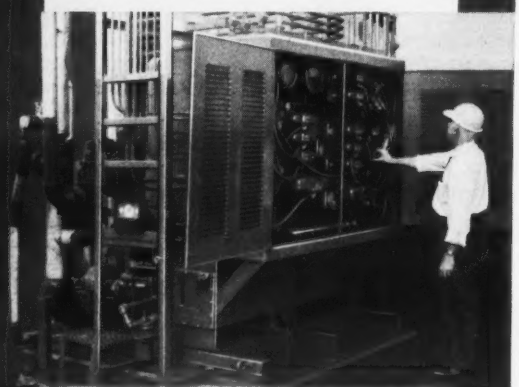
Eighty-two Years of Service to the Process and Power Industries



Packaged hydraulic systems assure faster, more reliable process control

Constant displacement piston pumps driven by low pressure steam turbines deliver fire-resistant fluid to accumulators for energy storage. Thus, high horsepower output for fast opening and closing of process control valves is obtained with low horsepower input.

Control console and power unit form electro-hydraulic system for controlling automatic heat treatment cycle. Physical layout provides optimum circuit efficiency, ease of servicing, and good appearance.



This power package includes all hydraulic pumps and valves for complete control of automatic cyclic operation of process in a butadiene plant.

Fast and precisely controlled motions, having the high reliability demanded by modern processing, are inherent characteristics of hydraulics. In addition, these advantages are obtained at low cost, for you can cover your full range of operations—from valve control to power transmission—with standard Vickers components. Your engineers enjoy unlimited design flexibility through a choice of electric, electronic, pneumatic and manual signals to control the hydraulic pumps, motors, cylinders, and variable speed drives.

Vickers complete packaged systems are ready to go into service upon arrival in your plant, since they are thoroughly pretested before shipment. They are properly designed and built to give maximum service life with little downtime, thus helping to keep your plant on stream.

Get more information on the job being done by Vickers packaged hydraulic systems in chemical, petrochemical, petroleum refining, and other processing industries by writing today for Bulletin I5802, "Packaged Hydraulic Systems for Process Control."

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conventions and exhibits

Mar. 2. Drug, Chemical & Allied Trades Association, Annual Banquet, Waldorf-Astoria Hotel, New York, N.Y.

Mar. 13-17. National Association of Corrosion Engineers, Annual Conference, Statler Hotel, Buffalo, N.Y.

Mar. 20. American Society of Lubrication Engineers, Boston Section, Symposium on "The 5 R's of Lubrication," 1200 Beacon Street Hotel, Boston, Mass.

Mar. 20-24. American Society for Metals, 12th Western Metal Congress and Exposition, Pan-Pacific Auditorium, Los Angeles, Calif.

Mar. 21-23. 23rd Annual American Power Conference, Sherman Hotel, Chicago, Ill.

Mar. 21-30. American Chemical Society, National Meeting, St. Louis, Mo.

Mar. 22. American Institute of Chemical Engineers, One Day Symposium on "New Developments," Conrad Hilton Hotel, Chicago, Ill.

Mar. 27-31. Instrument Society of America, American Institute of Physics and National Bureau of Standards, National Symposium, "Temperature — Its Measurement and Control in Science and Industry," Veterans Memorial Auditorium, Columbus, Ohio.

Mar. 28-29. Commercial Chemical Development Association, Meeting, Hotel Roosevelt, New York City.

Apr. 10-13. 30th National Packaging Exposition, American Management Association, Exposition Hall, Chicago, Ill.

Apr. 17-19. 7th National ISA Symposium on "Instrumental Methods of Analysis," Shamrock-Hilton Hotel, Houston, Texas.

Apr. 18-20. 5th Annual Industrial Mutual Aid and

. . . Meetings and shows of interest to the chemical industries

Disaster Control Seminar, Shamrock-Hilton Hotel, Houston, Texas.

Apr. 27-28. Fiber Society, Spring Meeting, Georgia Center for Continuing Education, Athens, Ga.

Apr. 30-*May* 3. Pharmaceutical Manufacturers Association, Annual Meeting, Greenbrier Hotel, White Sulphur Springs, W. Va.

Apr. 30-*May* 4. Electrochemical Society, Claypool Hotel, Indianapolis, Ind.

May 1-3. 34th Annual Meeting, American Oil Chemists' Society, Sheraton-Jefferson Hotel, St. Louis, Mo.

May 8-10. Instrument Society of America, 4th National Power Instrumentation Symposium, LaSalle Hotel, Chicago, Ill.

May 9-11. The Material Handling Institute, Inc., Eastern States Show, Philadelphia Trade and Convention Center, Philadelphia, Pa.

May 10-12. ISA Pulp and Paper Instrumentation Symposium, Northland Hotel, Green Bay, Wis.

May 21-23. Fluid Controls Institute, Inc., Meeting, The Cloister, Sea Island, Ga.

May 22-24. Synthetic Organic Chemical Manufacturers Association, Spring Outing, Skytop Lodge, Skytop, Pa.

May 22-25. The Design Engineering Show and Conference, Cobo Hall, Detroit, Mich.

May 24-25. Commercial Chemical Development Association, Meeting, Bedford Springs Hotel, Bedford Springs, Pa.

June 5-9. 9th National Plastics Exposition, Coliseum, New York City, and the SPI National Plastics Conference, Commodore Hotel, New York City.

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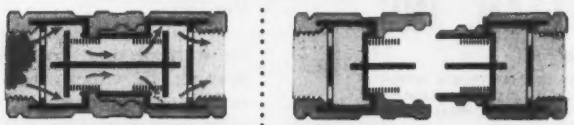

CONNECT—Full flow instantly

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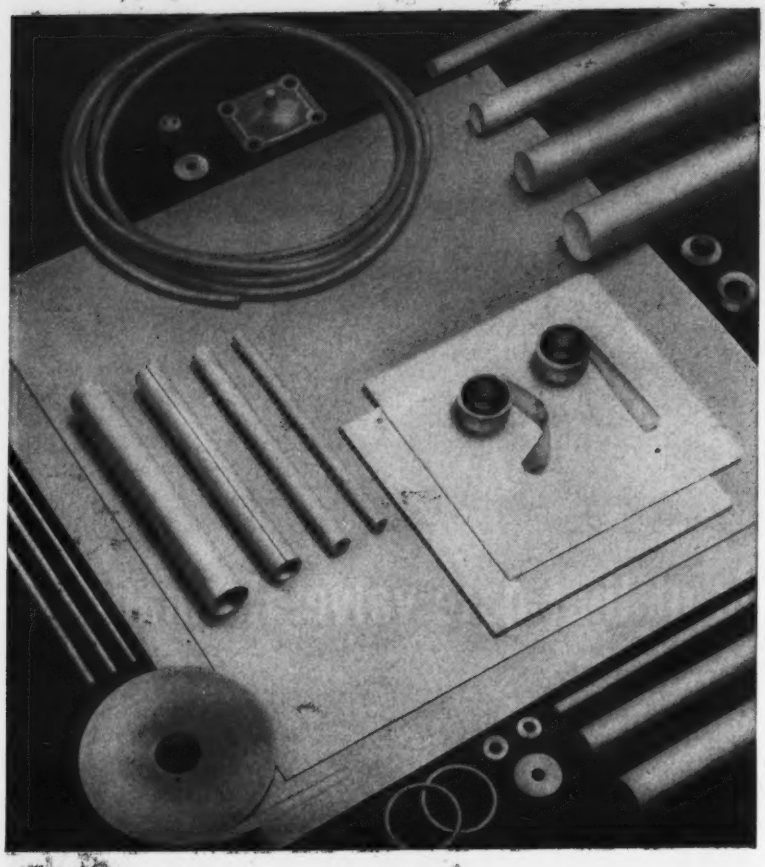

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*Du Pont trademark for its TFE-fluorocarbon resin

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Watching Washington

HEW Advisory Reports Spell Tighter Industry Controls

The Food and Drug Administration is cracking down on industry contacts with FDA personnel. The FDA has implemented the Kendall Report recommendation to discourage contact between chemical processors — or other industry representatives — and certain FDA employees.

The Kendall group was appointed by former Secretary of Health, Education, and Welfare Arthur S. Flemming to investigate charges of inefficiency, conflicts of interest, and industry influence in the FDA. Its recomendations concerned relations both with industry and state and local authorities, channels of scientific advice to the Commissioner, consumer education, training of scientists, and participation in scientific meetings.

On FDA's relations with industry, the Kendall Report recommended: "That a reasonable control be put upon the access of industry representatives to FDA personnel considering actions affecting the industry."

Flemming's favorable reaction led to an FDA order emphasizing these points:

1) FDA's responsibility cannot be delegated in any way to industry.

2) No FDA official shall commit the agency to any conclusion or action without full study and evaluation of all necessary information which officials must request and obtain from industry in addition to that information which industry voluntarily submits.

3) An appropriate record for the file covering any contact with industry shall be prepared so it will be available for review.

4) Undue solicitation or urging relative to the timing or substance of a decision is to be answered by politely but firmly advising that an answer will be provided as soon as it has been possible to evaluate the facts.

5) All supervisors shall review from time to time the manner in which their subordinates are handling contacts with industry.

The Kendall group was an instrument of the Eisenhower administration, and FDA's subsequent order was issued just before the change in administrations. However, HEW and FDA officials, as well as Washington observers in general, believe the order will be enforced by Secretary Abraham Ribicoff under the Kennedy administration. They point out that just such an order is in keeping with Kennedy policies.

The touchiest point was the Kendall recommendation to assure open channels for scientific advice to flow from FDA and other scientists to the Commissioner. A three-point FDA memo implements this recommendation:

1) Establish the position of Assistant Commissioner (Science) to serve as principal advisor to the Commissioner on scientific matters and to serve as a channel for views of scientists.

2) Increase the responsibility of the Deputy Director, Bureau of Biological and Physical Sciences, by assigning increased research responsibility there.

3) The Assistant Commissioner (Science) and the Deputy Director, Bureau of Biological and Physical Sciences, will assume the responsibilites of the present Scientific Director.

One of the early complaints that led to formation of the Kendall investigating group was that chemical-processing-industry scientists had the ear of the FDA, thus managing to exclude any contradictory views of other scientists.

Another FDA advisory committee report also strongly

affects chemical processors. This is the Citizens Advisory Committee report on 10-year objectives for the FDA.

This report recommends, and the new administration is certain to agree, that industry and trade associations contribute hundreds of million dollars — perhaps billions — to a greatly expanded testing and research program. It goes on to state that "industry must bear the bulk of the costs required to achieve the basic objective" (a safe, pure, wholesome, and informatively represented supply of foods, drugs, cosmetics, and therapeutic devices).

The Citizens Advisory Committee suggested the order of magnitude figure for industry's contribution, but could not pin it down to an exact amount "because these costs are not readily separable from the over-all operating costs of the regulated industries."

Air-pollution Attack Is Urged

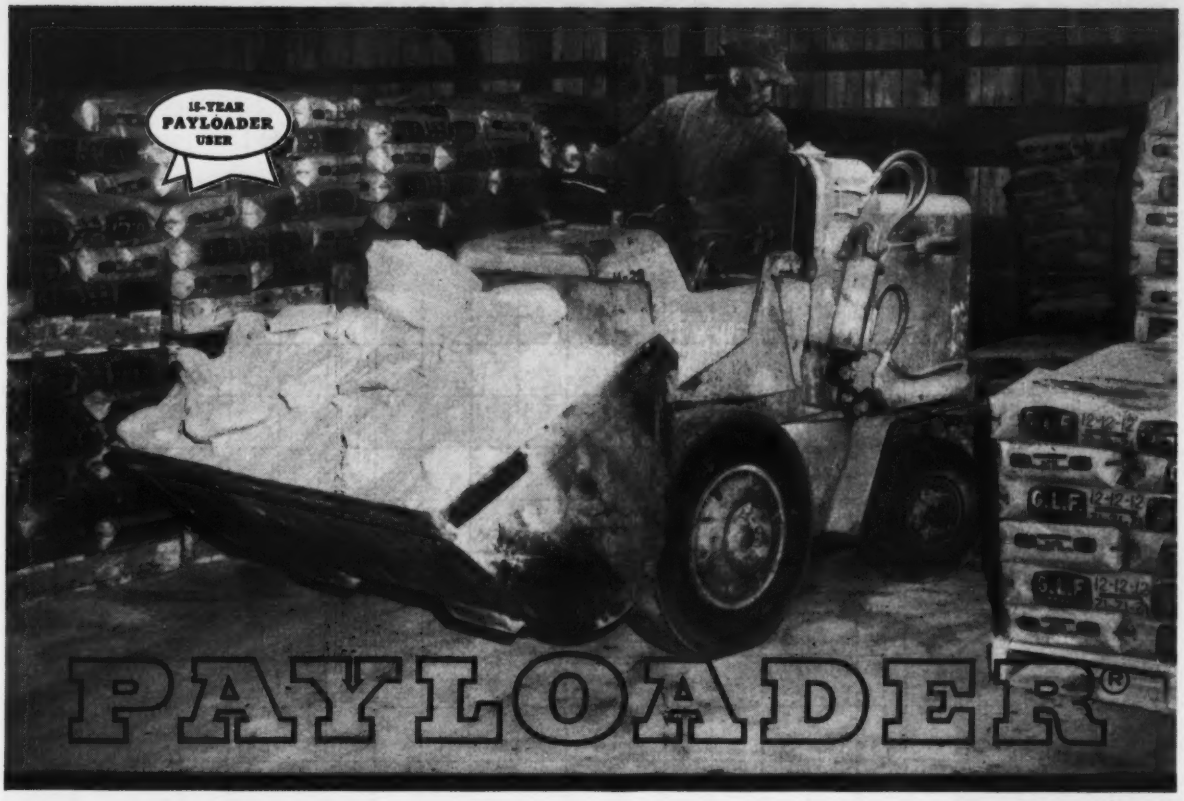
Still a third advisory report in the Health, Education, and Welfare Department most strongly of all affects chemical processors. This is the report of a Public Health Service advisory committee to the Surgeon General on air pollution.

The committee urges that industry be assessed 28% of the cost of a major new attack on air pollution. It recommends that the present research program costing about $11 million per year be expanded to about $32 million annually by 1968. The Federal government would pay 40%, state and local government 32%.

The 40-page report — prepared by educators, state and local health authorities, and industry representatives appointed by former Surgeon General Leroy E. Burney — recommended ten national goals for the next decade:

1) Determine the effects of air pollution on human health.

2) Determine the effects on the Nation's agricultural economy resulting from air-pollu-



continuous, dependable production

A 4-wheel drive PAYLOADER (Model H-70) is used by the Mills Division of G.L.F. to switch an average of 50 in and out-bound railroad cars daily on company-owned spur tracks. An average push moves 4 or 5 cars at a time. Average weight of loaded car is 95-tons.

1,500 hours and no downtime . . . that's the record of the H-25 PAYLOADER in its first year of operation in the Soil Building Division, Co-operative G.L.F. Exchange, Inc., at the Port of Albany, N. Y. This performance prompted Manager Harold Davis to say, "Our H-25 PAYLOADER proved to be a real workhorse . . . ruggedly constructed for continuous, dependable production."

G.L.F. has plenty of experience to back up this judgment. They manufacture granular fertilizer at the rate of 30,000-tons annually at this plant, and have used PAYLOADER tractor-shovels for 15 years to unload rail-cars, convey materials to the mixing operation, charge bagging machines and for bulk loading at their many plants.

In logging 1,500 hours, they estimate this PAYLOADER handled 30,000 tons of fertilizer on a maximum 200-foot delivery cycle: Conveying materials to storage, it averaged 20 tons per hour; in moving material from the bins to the packer it averaged 15-20 ton per hour.

Production Protection . . . many special features are "built-into" the H-25 PAYLOADER to protect its mechanical and electric parts against downtime due to damage from dust, moisture and corrosion. Also, it is the only loader in the 2,500-lb. operating capacity class with a *complete* power-shift transmission (2 forward and 2 reverse speeds). Power-steering, power transfer differential and wet-sleeve overhead valve engine are standard. Call your nearby Hough Distributor for complete data and a demonstration on the H-25 or, return the coupon.

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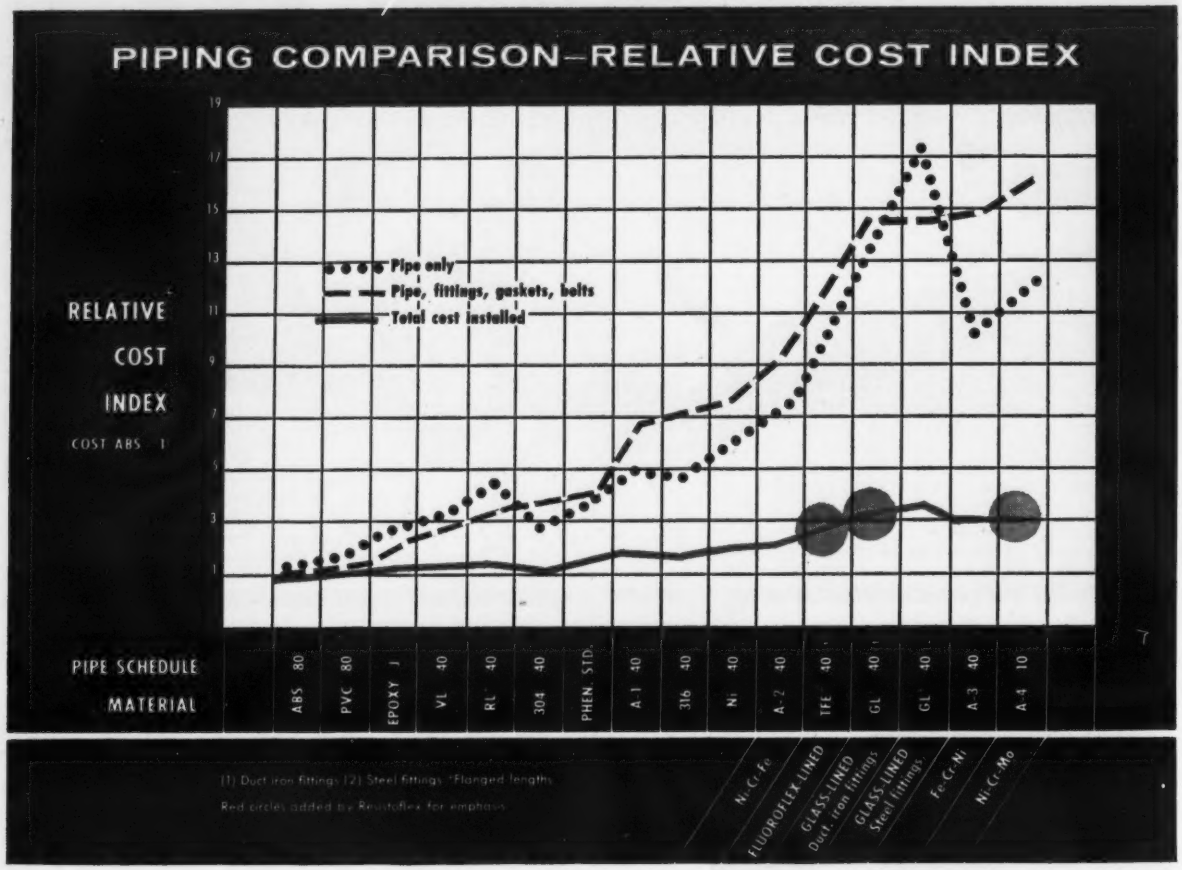
PROOF FROM LATEST COST ANALYSIS:

Fluoroflex pipe (LINED WITH TEFLON) cheaper in installed cost than glass-lined or high-alloy steel pipe!



This chart from new documented study tells the whole story:

Here's a report that's going to influence design thinking profoundly! It demonstrates that steel pipe lined with Teflon†, though at present more costly on a material basis, is comparable in installed cost with 316 stainless steel, and actually *cheaper* in installed cost than glass-lined pipe or high-alloy steel! (See chart above; complete figures available from Resistoflex).

Fluoroflex*, the proprietary product manufactured solely by Resistoflex, is fabricated Teflon at its best. Fluoroflex-lined steel pipe, because of its long service life, freedom from corrosion, contamination, and product loss, is actually *replacing* glass-lined, nickel alloy, and other corrosion-resistant piping materials.

It is at present being used in the manufacture of synthetic plastics, acrylics, polyethylene, polypropylene, styrene, rayon, and other materials necessitating high-corrosion processes. Because inner surfaces are non-contaminating, Fluoroflex-lined pipe is also ideally suited to the handling of high-purity and sanitary products.

If you are planning a corrosion-resistant piping installation, can you afford to overlook economic facts like this? Write to Resistoflex Corporation for your copy of the complete analysis, today. Plants in ROSELAND, N. J., Anaheim, Calif., Dallas, Tex. Sales offices in major cities.

†DuPont T.M. *Resistoflex T.M.

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tion damage to animals and crops.

3) Find better ways of measuring the economic loss from air-pollution damage to materials, soiling, and reduced visibility.

4) Find better ways of measuring and identifying air pollutants at their source and in community air.

5) Develop better techniques for assessing meteorological factors affecting air pollution.

6) Learn, through research, more about the formation of new pollutants from reactions in the air.

7) Expand our nationwide monitoring efforts.

8) Develop new methods and equipment for controlling the sources of air pollutants.

9) Build and disseminate a comprehensive body of knowledge related to the technical, legal, economic, and administrative aspects of air pollution.

10) Evaluate the legal and administrative practices related to air-pollution control.

The recommendations on air pollution very likely will be implemented by the Kennedy administration in the form of suggested legislation. These points all fall under various campaign promises. More, they reflect strongly some of the views expressed by Secretary Ribicoff, even before his appointment to head HEW.

Senate leaders are not waiting, though, for the White House to send up a bill. A coalition of influential Republicans and Democrats, headed by Sen. Thomas H. Kuchel (R-Calif.) already has drawn up a bill to give the Surgeon General authority to investigate localized air-pollution problems "of more than local significance." This bill was passed last year but was pigeonholed.

It is not probable that such will be the case this year in the Democrat-controlled committee since the new administration already has indicated it wants a strong air-pollution bill, and since two influential Democrat Senators are working actively to support it (Clair Engle, Calif., and Joseph S. Clark, Pa.). The fourth member of the coalition is Hugh Scott (R-Pa.).

OPERATING MANAGEMENT'S OWN MAGAZINE
JANUARY 1961
CHEMICAL PROCESSING

(Photo courtesy of Du Pont)

An increasing number of engineers are hanging up registration certificates. Will these soon be mandatory?

Registration for engineers — optional or required?

Survey shows that movement is starting to snowball . . . but outcome is still questionable

By **TED F. MEINHOLD,** Associate Editor

PROFESSIONAL REGISTRATION of engineers is here to stay — there is no doubt about it. An increasing number of engineers — in both industry and Government — are hanging up new, crisp certificates. Records show that there are now over 250,000 licensed engineers in the U.S. — an increase of over 65% in the last 10 years.

How does the chemical industry feel about registration? We have just felt its pulse by querying a dozen major chemical companies. Among these were Allied Chemical, Dow Chemical, Du Pont, Grace, Hercules, Hooker, Monsanto, Phillips Petroleum, Reichhold, Shell Chemical, U.S.I. and Witco.

The majority make no bones about it . . . they encourage licensing for their engineers. Although three reported "no official policy", none discouraged the action. Some typical comments were: . . . "we feel that it helps to make a better engineer" . . . "registration is considered a mark of progress and carries with it recognition that the individual has reached a professional level" . . . "it serves an important function not only professionally, but is also in the best interests of the public" . . . "the man who is licensed has shown more initiative and desire for professional recognition and competence than those who are not."

When asked *how* they encouraged registration, only two firms reported that they had any sort of a formal assistance program (license fees, refresher course tuition, etc.). Most stated that they utilized other means of personal encouragement, such as occasional letters and memorandums from supervisors pointing out benefits of registration, and by giving public recognition to newly licensed engineers in company newspapers, magazines or bulletins.

Registration Prerequisite For Employment?

The question, "Do you hire registered engineers only?", brought a resounding "no" from all the organizations surveyed. A few revealed, however, that a certificate is considered a plus factor. One company expressed it this way: "If two men of similar abilities were to apply, one with and one without the PE license, we would probably hire the one with the license."

It was also pointed out that in some cases local regulations may require that a man filling a specific job in a certain department (central engineering group, for example) be a registered professional engineer. This has not presented much of a problem, though, because most companies have such personnel available or can retain some local person with the necessary qualifications when required.

Generally, licensed engineers receive no preference in advancement considerations. Promotions usually are based on performance alone.

However, some companies are quick to add that registration is often the mark of the

Current Thinking Often At Opposite Poles

- ". . . Engineering registration should not be misconstrued as an indication of a man's ability; it can be looked upon as *certified mediocrity*. Obviously, the individual must be judged on his achievements and the ability he demonstrates."
- "I think we can safely conclude that in the eyes of the public, the certificate of registration . . . is the mark of the "professional" — it is the layman's assurance that you can be entrusted with the work involved in the practice of engineering."

Registration for engineers — *From preceding page*

better man. They point out that experience seems to indicate that the engineer who possesses a license is usually the same person who has demonstrated superior competence and drive.

One firm that employs over 2000 graduate engineers — 40% of whom are registered — slyly expressed its viewpoints this way: "Nearly all of our engineers in supervisory positions are already licensed; so registration as a consideration for promotion is not of particular concern to us!"

What About the Future?

One-third of the organizations surveyed expected registration to play a larger role in the future. The remainder visualized little or no change and saw no need to modify their current policies.

One of the largest companies included in our survey made this comment: "The time may be approaching when *all* engineers will be required by law (and it would be enforced) to register . . . whether they are doing what is now defined as public works, consulting, or privately employed. Customer-service work might be construed as consultation when engineering advice is given to customers."

Based on the results of the survey, there is an obvious conclusion that can be reached: Registration is rapidly gaining in importance and it will continue to do so in the future.

Young Engineers: Register!

The registration trend being what it is, we offer this advice: Engineers would be wise to obtain their license as soon as possible after graduating from college! This will also be the easiest time for them to pass the registration examination, since all of their academic training will still be fresh in their minds.

Why take chances? Registration in all likelihood will play a big part in helping these engineers protect the investment that they have made in their education.

We are not alone in this belief either. The Engineers Council for Professional Development, an organization made up of eight engineering societies, cities this advice in its "Guide for Young Engineers": "If the rapid growth in registration continues, it is safe to predict that by the time today's graduates reach maturity the practice will be practically universal.

"The young graduate must want to keep all doors of opportunity open until he is firmly settled in his career, and there are some he cannot enter without a license as a key. Registration will help the engineer obtain professional status in any other state or country to which his work may take him."

AIChE More Cautious

Although a member of ECPD, The American Institute of Chemical Engineers is a bit more reserved in this respect. In a statement released by the group's council its position was outlined as follows: " . . . Although AIChE does not believe that registration of itself contributes significantly to professional responsibility and professional development, it recognizes that in some cases, registration is considered to be one mark of public recognition of professional status.

"Registration should be accorded no greater importance than is placed on other indications of professional status, such as academic degrees, membership in professional organizations, technical publications, and advancement in industrial, academic and governmental careers."

Continuing, the Institute flatly states that it is not in favor of *compulsory* registration for all engineers. It recognizes, however, that all states have now enacted engineering registration laws, and it is possible that any engineer in the course of his career may wish to become engaged in activities requiring registration.

Therefore, AIChE recommends that its members should, as a practical expedient, become registered in their respective states as soon as possible after entering the profession.

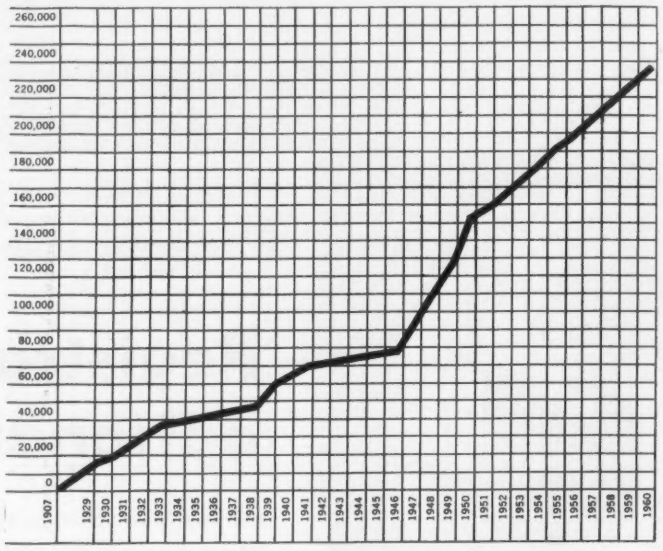
Issue Still in Doubt

Turning again to the results of our survey, we can safely assure our readers that registration for engineers in the chemical industry is — and will continue to be for some time — optional. To the best of our knowledge, no chemical firm has as yet made it a condition for employment.

However, continuous pressure is being exerted by powerful organizations to change this.

One chemical industry spokesman offered this comment: "There seems to be a definite tie between registration and membership in NSPE (National Society of Professional Engineers). The possibility exists that this organization may emerge as the ethical and legal watchdog of the engineering profession, somewhat like the American Bar Association and American Medical Association in their professions." If this happens, there will no longer be much doubt as to the outcome of the registration issue. NSPE has made it quite clear as to what its position is. ■

Registration Climbs



Growth in engineering registration 1907-1960. Chart is based on figures supplied by National Council of State Boards of Engineering Examiners. More recent data indicates that the curve has passed the 250,000 mark

Why Registration?

What's the true purpose of registration? Basically, there are two. The *legal* purpose of public registration is to safeguard life, health and property — and to promote public welfare.

The second purpose deals with *professional recognition.* Many proponents believe that registration is the only tool that will bestow "professionalism" — and all its inherent rewards — upon engineers. Analogies with the medical and legal profession are obvious.

There are also those who believe that no man should possess the title of "engineer" unless he has a license to practice. Laws requiring engineers to register have been enacted in all of our states. The battle is on to see if they can be enforced.

Synthetic detergents in waste water are blamed for foam such as this shown spilling over from the aeration tank of a sewage works in England. Conditions in U. S. have been equally severe in some instances

Photo Courtesy United Kingdom Information Service

NEEDED: synthetic detergents more easily removed from waste water

Common alkyl benzene sulfonates are being blamed for many sewage-plant foam problems and murky well waters. But chemical research is being stepped up to help the situation . . . witness Great Britain's new easily metabolized ABS

By **GORDON WEYERMULLER**
Associate Editor, Chemical Business

SYNTHETIC DETERGENTS have been gradually displacing traditional soaps in American homes and industries since World War II. About 75% of the combined sales are of the synthetic detergent type at present. Annual production of commercial synthetic detergents is running at a rate more than three billion pounds.

Addition of this tremendous quantity of synthetic detergents to water, which must leave the household or plant in some manner, has brought problems. Nearly all household synthetic detergents contain an average of 25% alkyl benzene sulfonate, or ABS, which is not readily removed or decomposed by conventional sewage-treatment plants. The ABS is a factor in foaming at sewage plants. Also, septic-tank effluent which contains ABS has seeped into groundwater and the ABS, along with other contaminants, has appeared in water drawn from wells in a number of locations.

This side of the controversy can be countered by those who point out that there is no evidence that ABS is toxic to man in the quantities reported . . . if it is not harmful, then perhaps it is not a major problem. These people then say that the presence of ABS in waste water going into rivers is due in part to overtaxed municipal sewage systems — and that ABS in well water is due to the widespread use of septic tanks in new housing developments.

An examination of both sides of the controversy in more detail will help to evaluate the seriousness of the problem and ascertain what lies ahead.

Foaming Is Problem For Sewage Plants

First, numerous sewage-treatment plants in the U. S. have had difficulties with foaming which has been traced, at least in part, to the presence of ABS in wastes being treated. This foam blows on the walkways up to a height of several feet and makes it difficult to operate valves. Wet, slippery walkways are hazardous. If someone were to fall into a tank, it would be difficult to locate him for rescue. Also, the foam may be a health hazard since the bacteria counts in the foam have been found to be 20 times as great as in the liquid phase.

A critical question which has not been answered is: In view of the tendency of waste water to foam in the activated-sludge treatment process, would the foaming problem still exist even if ABS were not present?

A recent research project conducted at the University of Wisconsin established that ABS is not the only culprit — that solids content, pH, temperature and protein degradation products are important factors, too. It has been suggested that foaming can be controlled by maintaining high solids levels, using defoaming agents and by cold-water sprays.

ABS Not Easily Removed From Waste Water

In addition to the foaming problem, municipal sewage-treatment plants have found that only about 50% of the ABS may be removed in a conventional sewage-treat-

ment process using activated sludge as a secondary step in treatment. Moreover, all of the remaining ABS is not readily destroyed in a river.

A recent project conducted by The Metropolitan Sanitary District of Greater Chicago made an extensive study of ABS in the Illinois River for a distance of 167 miles from Chicago. Approximately 50% of the ABS was removed in the treatment works. The other half was discharged with the plant effluent to the waterway. For the first 53 miles, the quantity of ABS increased because of additions from other communities and tributaries. From the peak load at Morris, Illinois, down to Pekin, Illinois, the last station — a distance of 114 miles — 37% of the ABS was removed. Considering the original amount of ABS which entered the Chicago treatment plant, 69% overall removal was effected by sewage treatment and assimilation in the river.

Suds and cloudiness in Chanute tap water in glass at left and in jug are said to have been due to the presence of ABS from detergents in reclaimed waste water used during period of severe drought. Clear water in glass at right is tap water from Parsons, Kansas

Concentration of ABS, which is related to total quantity only by consideration of flow in various parts of the waterway, was found to vary from 1.6 mg/l near the treatment-plant effluent to 0.5 at Pekin. The ABS in nearly all of the waterway is above that being considered in the proposed "USPHS Drinking Water Standards." And — standard water-treating methods are not too effective in removing the ABS.

According to Graham Walton, U. S. Department of Health, Education and Welfare, the Technical Subcommittee on revision of the Public Health Service Drinking Water Standards has under consideration a proposal that the ABS concentration should not exceed 0.5 mg/l.

This limit is based on the apparent effect the presence of ABS has on the aesthetic quality of water. Mr. Walton suggests that a much higher concentration could be permitted if health were the only consideration. However, foaming and bubbles may appear in water with above 0.5 mg/l ABS, and most people question the quality of such water for drinking, even though it is not actually harmful. The presence of ABS as an indicator of other actual and potential pollution was also a factor in level established by the USPHS.

Drought At Chanute, Kansas, Suggests Future Problem

During the most severe drought in Kansas history, in 1956-57, Chanute, Kansas, a city of 12,000 population, used recirculated, treated sewage water as the source of city water for a period of five months. Safeguards taken included heavy chlorination and frequent bacteriological testing. No evidence of anyone becoming ill from the water was reported by doctors in the city.

However, the water supplied to users contained at one time as much as 5.1 mg/l of ABS. Water drawn from taps frequently had a murky appearance, with ½ inch of foam on top of a glass full. While many people used the tap water, sales of bottled water flourished — practically every grocery store kept a large stock.

Although the Chanute case is an exceptional one, the problem of adequate water of satisfactory purity is one of increasing importance in many parts of the U. S. In other cities it may be necessary to reuse waste water. This was considered by the men who conducted the Chanute experiment to be not much different from using the effluent from a stream which contains the sewage from other nearby communities upstream.

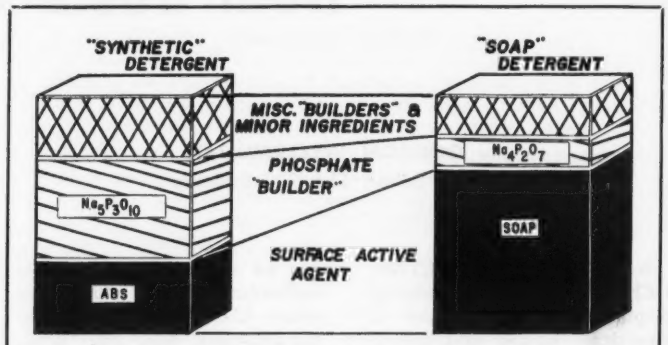
Suffolk County, L. I., Example Of Underground Water Problem

A problem that may be even more serious than ABS in waterways is its presence in groundwater. It may take 5-10 years for it to be removed from groundwater once it has saturated an area.

It has been estimated that there are or soon will be 17,000 ABS-contaminated wells in Suffolk County, L. I. Studies made in a number of other communities on the fringe of metropolitan areas also indicate the presence of ABS in wells. For example, maximum ABS concentrations of 0.2 up to 4.1 mg/l have been found in the metropolitan areas of Huntsville, Alabama; Miami, Florida; Minneapolis, Minnesota; Albuquerque, New Mexico; Norfolk, Virginia; and La Crosse, Wisconsin.

Prime reason for the problem is that these suburban communities have septic tanks instead of a regular sewage system. The septic tank is often inefficient and inadequate, particularly after a few years service. At best, septic tanks cannot be expected to remove more than 10 to 20% of the ABS. But builders generally favor septic tanks since they cost less than a regular sewage system, and potential homeowners do not usually place a higher value on a house with access to a city sewer.*

The presence of ABS in wells may actually be a valuable warning to the homeowner. Although the ABS itself is harmless, it flashes the warning of potentially dangerous bacteria that are likely to also be in the water and are more difficult to detect than ABS.



Two major types of washing products in use in United States. Synthetic detergent at left contains alkyl benzene sulfonate or ABS, which is not easily disposed of in waste water. Conventional soap detergent at right has as its major ingredient a sodium or potassium salt of a high-molecular-weight fatty acid, which is more easily removed from waste water

Despite the controversial nature of the whole subject, nearly everyone agrees that it would be desirable to mini-

*The Business and Defense Service Administration has estimated that the U. S. investment in municipal sewage systems is already at least $6.9 billion short of what it should be, and investment in waterworks is short by $4.6 billion of the needs.

mize ABS in waste water. Consequently, the major U. S. soap and detergent companies, as well as the companies who supply them chemicals, are earnestly working to develop a "soft" detergent. The company who comes up with something good will not only aid the sewage-treatment people, but will be making a contribution to improved water quality.

British Experiment With 'Soft' ABS

A full-scale project on the problem of ABS in waste water has been under way for two years in an area surrounding the River Lee in England. The cities of Luton, with a population of 110,000, and Harpenden, with a population of 15,000, are in the area where the experiment is being conducted.

In this area a different type of ABS, more easily metabolized by the bacteria normally present in sewage-treatment plants than conventional ABS, was used in the detergents manufactured for use in this area. Detergent manufacturers cooperated with the English government on the project.

Chemically, how do the two types of ABS compare? Conventional ABS is composed of a mixture of mono-substituted benzenes, the alkyl substituent of which is highly branched. No evidence has been found of the presence of methylene chains exceeding three carbons in length. The sulfonate is essentially para-substituted tertiary alkyl benzene sulfonate.

The new, more easily metabolized ABS has less branched alkyl chains than the old. Good evidence of the presence of methylene chains exceeding three carbons in length has been found. The product appears to be a secondary alkyl benzene sulfonate, with a small proportion of tertiary compounds also present.

Results obtained so far in the Luton experiment indicate that the new ABS is removed to a somewhat greater extent

To page 59

jamesbury "Double-Seal" BALL VALVES*
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2. Screwed end type
3. 6" flange with ST 490 operator
4. 6" flange for manual operation
5. PVC screwed end type
6. Screwed end with EM 25
7. Screwed end with PC 50 operator
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9. PVC flanged valve

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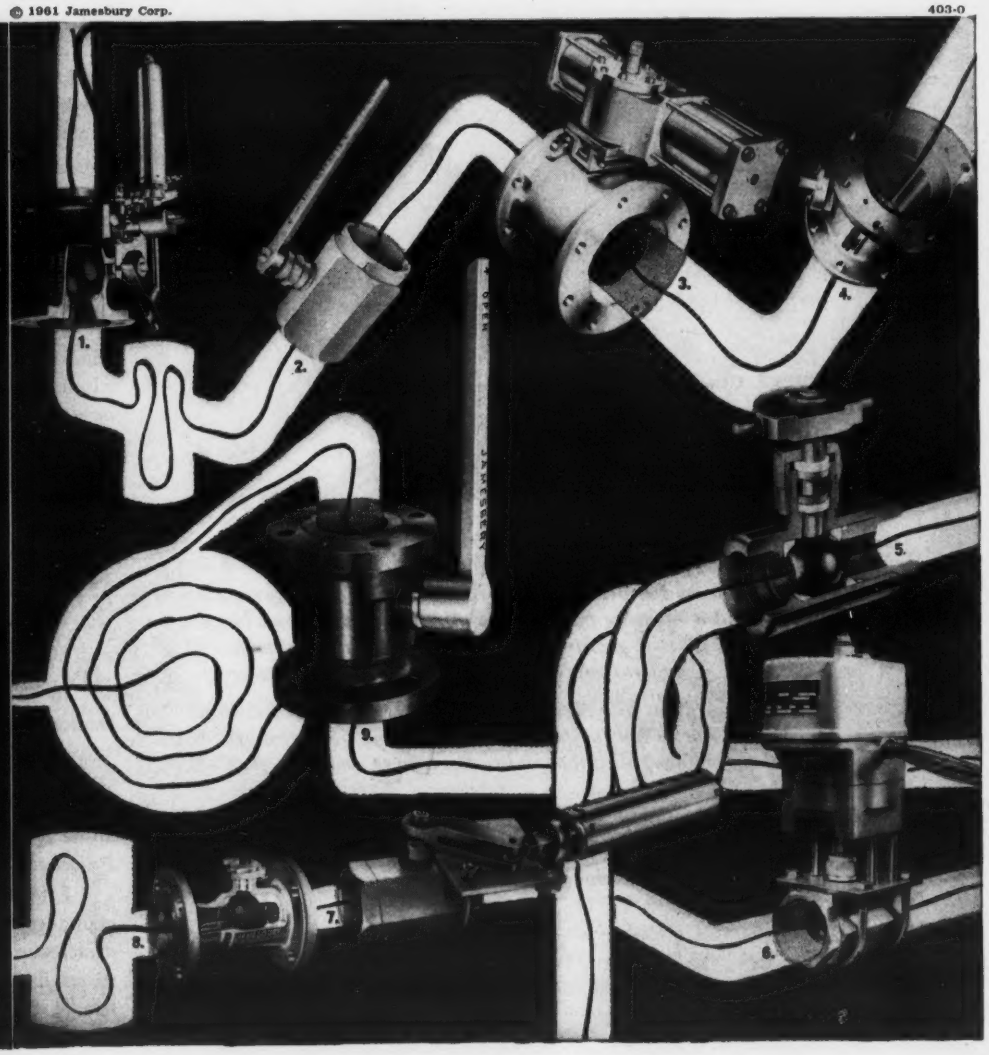
*10" and 12" on application

*600# series on application.



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Polycarbonates . . .

How a chance selection of a chemical created a commercial success

BY JOHN C. VAALER
Editor - Chicago

A. E. SHUBERT, General Manager, Chemical Materials Department General Electric Company

Another team has been added to the "Pioneers of Progress" — and it is fitting that we recognize Dr. Shubert and his General Electric group for their work in the development and commercial production of polycarbonates.

From pilot plant to a commercial success is no easy achievement. But, when the product finds a broad field of more than 300 applications in less than three years it is even more remarkable.

Those applications will widen considerably as prospective users gain knowledge of the high impact strength and unusual dimensional stability of these polycarbonates.

IT HAD BEEN, until a few years ago, the dream of scientists, ever since the days when Dr. Baekelund created the first of the synthetic plastic resins, to develop a plastic that had high impact resistance and dimensional stability equal to metal or glass-reinforced thermosetting plastics. That dream has now been fulfilled with the development of a polycarbonate thermoplastic resin. Polycarbonate resin represents a new class of plastic materials. Name is taken from the carbonate linkage which joins the organic units in the polymer molecules.

Its outstanding impact resistance puts it in a class with glass fiber reinforced thermosetting materials. It approaches the strength of metals, and, like metals, can be drawn forged and stamped.

This is the story of the Lexan® polycarbonate resin development and how selection of a chemical made by chance turned an experiment into a highly successful commercial reality. It is also the story of the General Electric team that moved this laboratory "surprise" from the pilot plant into commercial success in the amazingly short time of less than three years.

This also tells of the recognition of an American company as a "Pioneer of Progress" in the commercially promising field of polycarbonates.

And yet, the General Electric team was not completely alone in the polycarbonate field. As is the case with many major breakthroughs, there is a spontaneous generation of similar ideas. It became apparent within a short period of time that Farbenfabriken-Bayer AG had made materials of similar chemical composition. A cross-licensing agreement has been worked out between the Bayer Company and General Electric Company.

Mobay Chemical Company, a jointly-owned company of Monsanto and Farbenfabriken-Bayer, is now producing polycarbonate resins in commercial quantities. Other organizations are actively looking and working in the polycarbonate field.

Lucky Trial Starts Progress

In the early 1950s, a General Electric Company chemist, Dr. Daniel W. Fox, was engaged in developmental work at Schenectady on polyesters for use as wire enamels for high-temperature applications. He recalled his graduate-school project with di-carbonates. In that study he learned that they were highly stable and difficult to break down. So he asked himself this question "If di-carbonates are so darn stable, I'd better find a way to make them."

Later he was able to polymerize carbonates. The only way compound could be removed from the glass container in which it was made, was to break the glass. This left the stainless steel shaft of the stirrer fixed to the polymerized material. With the stirrer shaft as a handle, the polymer became the head of a "hammer" hard enough to withstand the hardest blows.

Fox analyzed that he would need a compound that had two hy-

B

C

GE'S research and market development team

D

E

F

B) D. W. FOX, Manager, Product Development
C) L. S. MOODY, Manager, Polycarbonate Research and Development
D) R. J. Thompson, Manager, Lexan Market Development
E) KENNETH GOLDBLUM, Lexan Product Development Chemist
F) E. F. FIELDER, Lexan Technical Service Specialist

G

H

I

Production and engineering group at Mount Vernon

G) GEORGE E. McCULLOUGH, Manager, Lexan Manufacturing
H) ROBERT G. WORMAN, Manager, Manufacturing Engineering
I) ROBERT L. HATCH, Manager, Shop Operations

droxyl groups as a starting material to react with phosgene. It was purely by chance that he found Bisphenol A available on the lab shelf, and considered that since it had the necessary structure, it might work in the reaction.

Later it was found that Bisphenol A was the best selection. In testing more than 100 other compounds, none developed the properties possible with the original selection.

Project Moves To Pittsfield. Notification of this discovery was received at Pittsfield and the project was transferred to the Chemical Development Department some months after Fox's discovery.

Doctors K. B. Goldblum and Eugene Goldberg moved into the picture at this time. Work was undertaken to increase the knowledge about the material, its properties and its possible product forms. This work was all done on a small scale.

In April 1956, the first published data sheet listing properties was assembled. Interestingly, the properties listed then correspond very closely to the current sheet for 1961. This proved that the early material would be suitable for the projected applications.

During early process development the first objective was to make 25 lb of the product for full-scale evaluation. The initial process did not readily lend itself to scale-up. Two years later a basic process change was made which permitted larger-scale production.

Moving along into the fall of 1955 the team started to expand. W. E. Christopher headed up market development along with L. S. Moody. Process development was placed in the hands of G. E. McCullough and R. L. Hatch. New-product development continued under Kenneth B. Goldblum. These three segments of the team continued under this arrangement until January 1959.

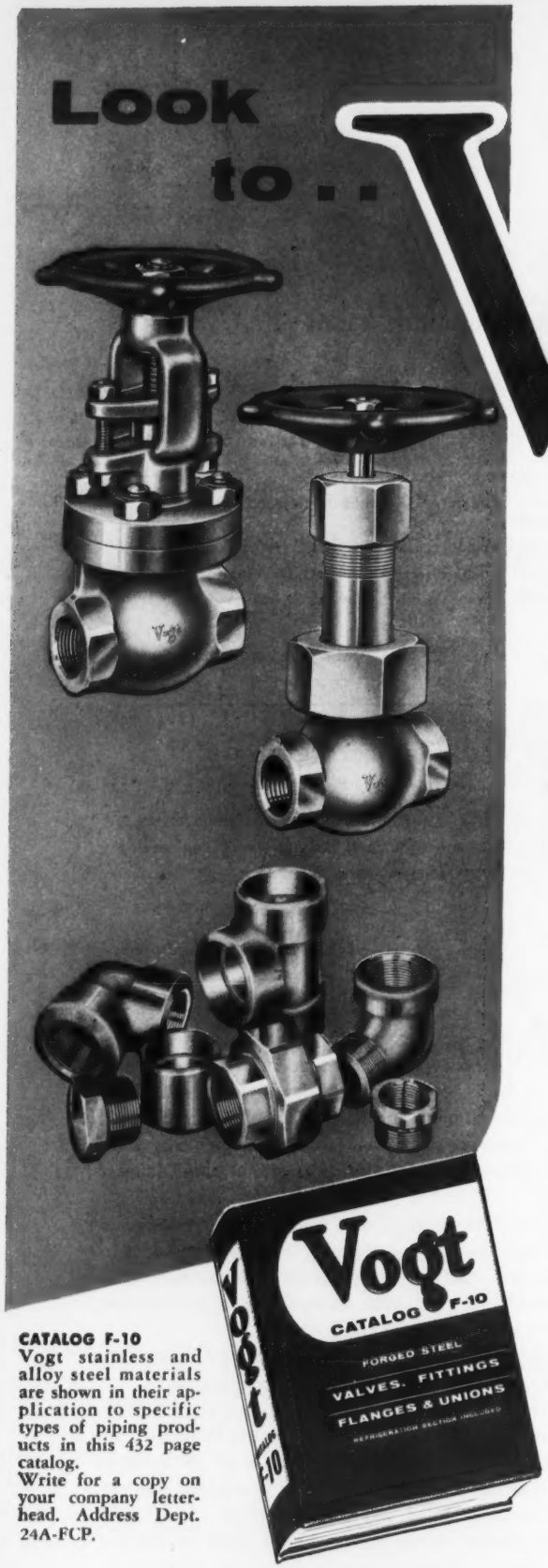
Early Exploitation. The five forms in which the polycarbonates could be exploited were: molding compound, film, fibers, monofilaments and varnish resins. Each of these product forms represents a different type of business in itself, with its own area of exploitation, and is at least in part a separate technical development.

For a number of reasons it was decided to concentrate on molding compounds. Later this proved to be the correct one for this group.

A limited market survey was undertaken in the spring of 1955. More than 60 contacts were made by a commercial firm, including calls on molders, government contacts and end users. As yet the polymer had not been named, it was simply referred to as Compound X-3000.

Result of this survey revealed that there could be a substantial market for a material having the properties claimed. This was the first clear-cut indication that a commercial business could be built on the product.

To next page



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The preliminary survey at this stage was not particularly costly. Had it been negative it could have saved thousands of dollars of additional expense.

As soon as commercial feasibility was established, an integrated effort was made to organize the polycarbonate program as an autonomous unit of the parent company. All factors such as research, development, engineering, marketing and production were included. Thus all aspects of the operation were looked at in detail during the initial stages of operation. This proved to be a great timesaver in getting the product to the market place.

Work continued throughout 1956 so as to manufacture increasing amounts of material, to permit adequate molding tests within the company, and to start limited product evaluation in the field. Also at this time the name "Lexan" was chosen.

A second market study was carried on during the fall and winter of 1956 and into the spring of 1957. This was more comprehensive than the first and included many more calls.

The report, resulting from this study, was even more optimistic than the first. Being based on more calls, and done in greater detail, it showed that a greater potential market volume existed than had been originally estimated.

At this stage the product form presented a problem. It was available only in powdered form and it couldn't be extruded or pelletized. Later, the problems of extrusion and pelletizing were solved.

Big Push Starts

Moving along into July 1956, Dr. A. E. Shubert was made manager of the development department. In this position he was to head up the strong effort on polycarbonates and also accept with the team the risk of bringing to commercial success this new polymer.

Here was a case where the project would have to stand

To page 56

Before you tackle process dynamics, be sound in unit operations

Solid working knowledge of fundamentals is essential, with stress on stoichiometry, thermodynamics and rate processes

By **IRVEN H. RINARD,** Central Staff Process Analyst
Production Analysis Group Manufacturing Services Div.
American Cyanamid Company

IT IS VIRTUALLY IMPOSSIBLE to pick up a current chemical engineering journal that does not contain either a paper or reference to such subjects as process dynamics, process control, and optimization. These are certainly among the forefront of glamor topics in chemical engineering today.

However, the real work required to develop these areas is just beginning. Needed among other things is a solid working knowledge of the fundamentals of unit operations. In all of these areas, a good share of the work lies in steady-state characterization of the process at hand, which is in essence a problem of analysis — to be commented on later.

The key to really effective process control is proper design of the process itself. A process may seem quite feasible from a steady-state point of view but be virtually impossible to control.

Process optimization — the maximation of the economic return of a process — invokes some extremely sophisticated mathematical techniques. Unless one has a simple but realistic mathematical description of the process to be optimized, these procedures either involve tremendous amounts of computer time or else yield absurd answers. Realization of potential gains from these new areas of endeavor will require shrewd blending of fundamentals with the ability to approximate.

In recent years the fundamental aspects of unit operations have received increasing scrutiny. Processes of mass, momentum and heat transfer are known to be similar physically in many respects. Since almost all the various unit operations involve one or more of these transfer processes they should have much in common.

Also, the mathematical description of many operations is the same even though the physical processes taking place may be quite different. Thus, the physical and mathematical similarities between different operations should permit a further unification of approach to the subject of the unit operations than has been achieved to date.

There are two basic types of problems that the chemical engineer faces in dealing with the unit operations. These may be described as the *design* problem and, as referred to earlier, the *analysis* problem.

Conventional Design

In the case of the design problem, the inputs and the outputs of a unit are specified in terms of flow rates, temperatures, pressures and the other pertinent physical variables. The problem is to discover a piece of equipment which will operate on the input streams to yield the specified output streams. Specifications must, of course, be consistent with the laws of nature.

In chemical engineering design as currently practiced, the generic type of equipment is usually known. Therefore, the design problem is merely one of determining the size of the equipment and, perhaps, the layout of some of the internals (such as baffles in heat exchangers or trays in distillation columns).

Higher Precision by Analysis

The other problem, that of analysis, concerns equipment of known size and layout (perhaps already installed and operating). Given inputs to the unit and the construction of the unit, the task becomes one of determining what the outputs *should* be — a type of problem which most often

Groundwork

You should know these as a prelude to solving a process design or analysis problem.

Purpose of Equipment
What is it supposed to do in the process? How?

Qualitative Understanding
Can you "picture" flow patterns through the equipment . . . the mechanism of mass, momentum and heat transfer . . . modes of contact?

Quantitative Understanding
Savvy with stoichiometry, thermodynamics and rate processes will permit building of a math model

Solution of Mathematical Model
Computer becoming essential here . . . but are you sure you're using it most efficiently?

The Author

Irven H. Rinard received his BS in chemical engineering from the University of Delaware in 1955. He did graduate work at MIT from 1955-1959, including a thesis on dynamics of heat-exchange equipment. In his present position, he is working in fields of process dynamics, process control, and the analysis of complex chemical processing systems.

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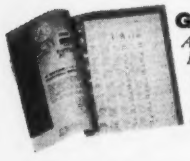

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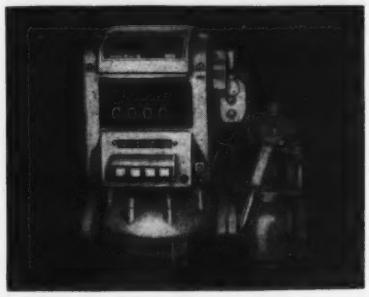
The Auto-Switch feature is available either with or without the mechanically coupled Auto-Stop valve.

In a typical example using the Auto-Switch Register with Auto-Stop valve, the operator clears the



register back to zero, and sets the register for the required number of gallons or pounds of liquid ingredient to be delivered to a kettle or mixing tank. He then opens the coupled Auto-Stop valve to start the cycle. This also closes (or opens) the switch. When the desired quantity has been delivered, the meter automatically trips the valve shut, and at the same time actuates the electric switch.

Gauge-Stick Errors of ⅛ in. Can Cost Thousands of Dollars

Inaccurate liquid measurements can add up to thousands of dollars a year in wasted materials, time, effort, to say nothing of lowered quality.

For instance, it's a tough job to read a gauge stick down inside a 4-ft. tank, particularly when the tank is being filled with hot steamy liquids, or when the liquid is swirling around. Yet an error of just ⅛ in. means that *one gallon too much or too little* has gone into the tank. This *can* add up to thousands of dollars in wasted batches in the course of a year's production.

For formula-perfect batches time after time, get rid of the stick and put a Neptune Auto-Stop meter in every liquid line leading to the blending tank or kettle.

arises in plant troubleshooting.

One determines what the outputs should be and compares them with the actual observed outputs. If they differ by much, a remedy is sought. Quite often, a very crude estimate of performance will serve the purpose.

The analysis problem also arises in optimization studies of both individual units and an entire plant. Here one wishes to find the best way to operate a given process, say, by maximization of a certain composition in an output stream. This requires solving for the process outputs as functions of the inputs and the process control variables (usually valve settings of a sort). Such a problem can become quite involved.

Necessary Groundwork

To tackle the two types of problems mentioned above the chemical engineer needs to know something about each of the following four different aspects of unit operations:

- *First,* he must know the *purpose* for which they are used, plus some idea of what the equipment looks like and what it does. This is mainly a matter of description or orientation.
- *Second,* he must have a firm understanding, at a *qualitative* level, of the physical processes taking place in the various types of equipment. He should have a picture in mind of the various regimes of fluid flow, the mechanisms of mass, momentum and heat transfer, and of the modes of contact of fluid phases. He should know about flow patterns in agitated vessels, across bubble-cap trays, through heat-exchanger shells, and through packed beds and columns. Again, this sort of information is mainly descriptive.
- *Third,* he must develop a *quantitative* understanding of the pertinent physical processes taking place in this equipment. Stoichiometry and thermodynamics are a necessary prerequisite. In addition to this, understanding of rate processes must be developed. One must know how, where

possible, to arrive at the rates of heat, mass and momentum transfer that may be involved in a given piece of equipment.

The combination of these three—stoichiometry, thermodynamics and rate processes — allows him to construct mathematical models of various processing units, or of typical segments such as a single distillation tray. Once he can do this, the chemical engineer is in a position to attack the problems of design and analysis.

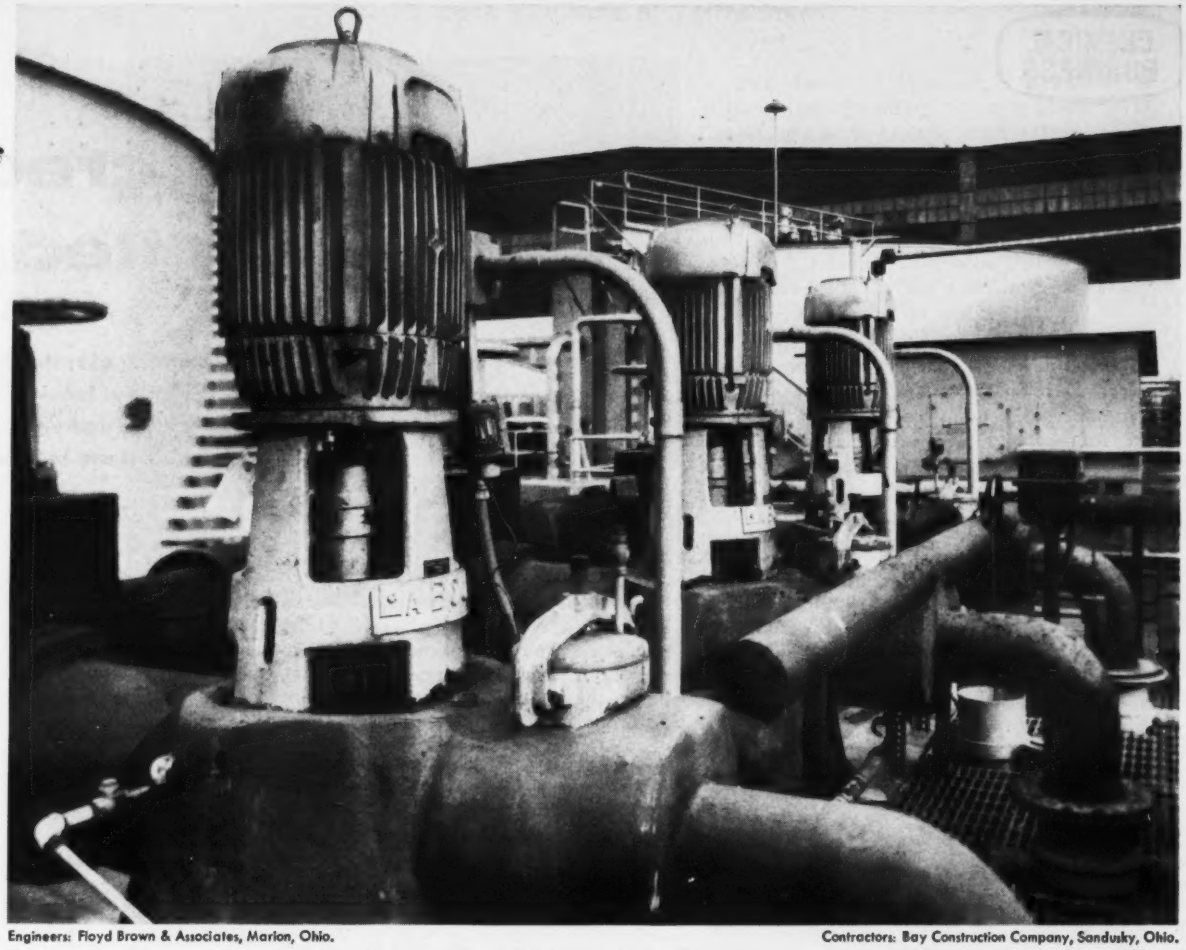
● The *fourth* area involves the *solution of mathematical models* required for the type of problem at hand, i.e. design or analysis. Many methods are available for various situations. Most of these are design-oriented. Also, quite a few are graphical. It should be pointed out that most of the techniques of solution are quite difficult.

Exact mathematical solutions of any simplicity of application are available only for the simplest cases. One of the best known examples is the use of the logarithmic mean temperature method in the design of two fluid heat exchangers. However, most dynamic design problems involve more involved computational methods. Some of these include plate-by-plate multicomponent distillation calculations, numerical integration in the sizing of cooler-condensers by the Colburn-Hougen method, and various elaborate graphical procedures for the sizing of absorption-distillation columns.

Which Approach: Empirical or Fundamental?

The question of proper level of approach must be raised, in practice. What situations require sophisticated approaches, and what require simple ones? Unfortunately, there is here a sharp difference of opinion.

Some advocate the "engineering science" approach. With such, the problem is attacked from as fundamental a level as possible. For instance, the starting point for problems in fluid mechanics is the derivation of the Navier-Stokes equations. *To page 57*



Engineers: Floyd Brown & Associates, Marion, Ohio. Contractors: Bay Construction Company, Sandusky, Ohio.

How to Dispose of 400,000 Troublesome Gallons Daily

Getting rid of industrial waste water containing acids, cleaners, glass particles and other assorted trouble makers at Westinghouse Electric Corporation's Mansfield, Ohio, plant is a job in which LaBour pumps play an important part.

The Mansfield plant produces home appliances from toasters to ranges and washers. Pickling and plating solutions are used in substantial volume, and porcelain enameling is also done here. Resulting wastes must be treated before the water is discharged into nearby stream. There are seven LaBour pumps in the treatment plant, pumping some 400,000 gallons every working day.

Any interruption in the proper functioning of the waste treatment plant would, of course, be costly. The LaBour pumps were chosen for their known dependability and minimum maintenance requirements—good reasons why you should choose LaBours where you are responsible.

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CHEMICAL BUSINESS

Plan now for creative use of the gifted youth of

We're beginning to realize the extreme urgency of recognizing, encouraging and developing top talent early. Industry may have to adopt some unusual procedures to make the most beneficial use of these individuals

ONE OF THE PROBLEMS of our day is the finding, training, and putting to effective use increasing numbers of better educated, more strongly goal-oriented young persons who are capable of coming up with entirely new (but necessarily often more complex) approaches to our industrial operations and problems.

In a recent article about U. S. research in Europe (CHEMICAL PROCESSING, Feb. 1961, p. 34), it was reported that some industrial research leaders believe they get a creatively different approach from European-trained scientists and technologists, one they find only rarely here.

If this is true, what has been happening to our young people of highest intellectual capability? Why haven't more of them acquired whatever it is that would make them, as educated adults, as equally effective as their European counterparts?

Great emphasis has for some time been laid on secondary education as a bottleneck to attempts of universities and industry to do what they can about the situation.

Now, as the result of efforts by many individuals and groups, something *is* being done about secondary education, particularly as regards science information and science motivation. This something amounts almost to a revolution in science teaching in the high school. Accompanying table summarizes progress.

As these activities mature, it is not unreasonable to expect that increasing numbers of such better developed and more adequately prepared youth will be entering the colleges and universities for their scientific and technological training.

There appears to be a widely held feeling among chemical-industry education leaders and consultants that the industry can expect gradual but significant improvement in the situation, primarily as it affects persons who will be taking on the roles that primarily keep things going with stable forward growth. This appears to be especially true with respect to basic research.

TOWARD A BETTER SECONDARY EDUCATION

. . . what's being done regarding chemistry

Project Talent — Data analysis and evaluation of nearly ½ million high school students.

Conant Surveys — First the high schools, then more recently the junior highs, have been studied by this famed organic chemist and university administrator. Conant leaves curriculum problems to the professional educators, asks that a far more serious motivation towards education be instilled, along with more rigorous scholastic demands.

Advanced Placement Program — In eighth year, with 10,000 students, 850 high schools and 560 colleges taking part. When started, colleges weren't ready. Now teachers and administrators have attended APP institutes last summer to speed process. Idea is to give some college freshman courses in high school, permitting successful candidates to enter into sophomore courses in cooperating college.

National Science Foundation — Logistically, the biggest current force. This summer providing over $24 million in grants to 20,000 high school and college teachers to attend 395 summer institutes in 260 colleges and universities, in-service institutes, and academic year (sabbatical) institutes for the purpose of acquiring new information about chemistry, physics, math, biology and other subjects, as well as new ways to teach them. Program also includes grants to 350 college and 310 high school science teachers to engage in research projects leading toward PhD degrees.

Chemical Bond Approach Course — Now in second year. Sponsors (include Chemical Education Division of ACS) have written text and lab manual. In 1960-61 being taught in 76 schools in 25 states, using materials revised as result of previous season's experience. This year to provide data for formal evaluation of program. Aids currently being translated into Spanish.

CHEM Study Course — Started by small group of high school teachers last summer. Endeavored to review best from material in use throughout nation, condense and synthesize new course. Presently in test in Los Angeles and San Francisco areas. More than 100 new high schools planning to test course next year. Same group is working up 20-30 teaching films, plus a group of monographs—to be completed for 1962-63 year.

Manufacturing Chemists Association — Through its teaching aid preparation, community affairs, college science teacher recognition and other programs, this group has pioneered in getting action started which is being continued and embellished by others (above). Has recently produced a book for elementary school experiments, on "Matter, Energy and Change," "Sources of Information on Careers Ahead in the Chemical Industry", "Facts Book of the Chemical Industry," "Teachers Guide to Facts Book" and others. In films, has produced (with Sutherland Educational Films, Inc.) "Combustion," "Chlorine," "Oxidation-Reduction," "Chemistry of Water."

Should Employer Teach Work Attitudes?

But here some disagreement exists over the matter of training for industrial work. As one industry man puts it, "The burden of training young people to *work* has largely fallen upon their em-

Case example of "giftedness"

Dick Lewis of Westport, Connecticut, is shown above (standing) when he was in 1958 attending the Pre-College Science Center sponsored by Dorr Foundation (headed by J. V. N. Dorr), at Loomis School, Windsor, Conn. "I'd always been interested in physical sciences . . . the Science Center enabled me to become aware of physical phenomena that I wouldn't have come into contact with until my second year at college.

"My really strong influences were, however, my science and chemistry teachers (Wm. H. Scheld and Charles Lawrence) at Westport High, and Dr. Harvey Russell (Education Service Manager for American Cyanamid Company and chairman, Education Committee, N.Y. Area, Mfg. Chemists' Assn. — *Ed.*). The high school classes were more like jam sessions . . . they taught 'inquiry' rather than dogma." Dick acquired Advanced Placement rating in five subjects, all Liberal Arts! . . . these were the only ones offered at time.

Dick (right) now a sophomore at Princeton, is shown helping a younger brother, Fred, who is following the same pattern at Westport High, is in Advanced Placement project in chemistry.

Dick is studying aeronautical engineering, rejected "engineering physics" as "jack-of-all-trades, master-of-none." He is deeply concerned about how to become a success in an industrial career. "I guess I'll have to go into sales as the best route to achieving some managerial level status by age 35, the creative limit. As a researcher, I'd probably not make management. A PhD is probably out as my father makes too much to permit me to qualify for a scholarship, and with two brothers to be educated, it would cost the family too much.

"A big-company recruiter recently said his firm didn't care too much for Princeton-trained theorists as they 'thought they knew too much.' I suppose this is a real problem, so I hope to take enough practical subject material to be able to appear real practical to my employer."

Fred chose Amherst to continue his Liberal Arts, majoring in chemistry. If he sees by his junior year a doctorate is out of question, "then I'll transfer to engineering at either MIT or Renssalear," both schools maintaining such interchange with Amherst.

During joint interview, younger brother Andy (age 8) commented on icy weather as related to dew point. Father is oil company executive.

CP Staff Photo

tomorrow

By **JOHN MELLECKER**
Editor-New York

ployers. Some of us feel it's a little late to be doing this job after the young person has received his college diploma. Instead of his being able to plunge right off into the kind of work that might best fit the better training in math and other underlying sciences, we're afraid the usual 'adjustment to practical working relationships' sets up too many mental road blocks — is apt to, for one thing, swing an individual who has really never learned teamwork to fall back on the protection of the group he is fitting into, if you know what I mean. . .

"We haven't, incidentally, found this situation to be a problem with PhD's . . . probably because they enter into a special level from the beginning and may not have so much adjusting to do. . ."

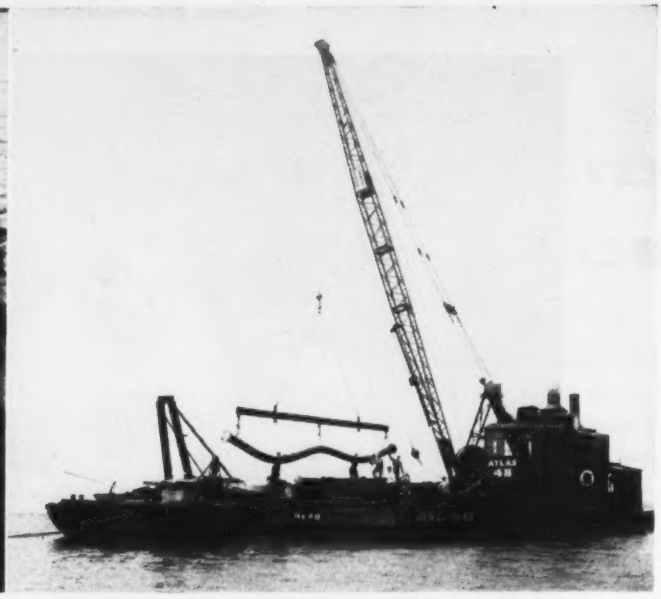
One company has had some success experimenting with two-year college graduates of technical institutes as technical aides, sending the superior ones along to finish out BS training at company expense, after a sufficient work experience to permit full evaluation of how the person fits in with company operations.

Perhaps this and the other approaches have been devised because of a basic problem: Lack of orientation, on the part of youth who enter college, as to the real work need for performance which may be of a quite technical nature. Opportunities for such work experience appear to be a need of the student and a chance for industry to present realistic views of its operations and goals.

A recent survey has unfolded some startling facts about the attitude-building process that goes on during the secondary-school years. Conducted by J. W. Getzels of the University of Chicago and P. W. Jackson, for the Office of Education, Department of Health, Education & Welfare, preliminary findings appear in a report entitled, "The Gifted Student." Children were found to aspire to the qualities that their parents and teachers linked with *success*, not the "giftedness" they might possess.

Parents were found to define the gifted child in terms of creativity, IQ, and goal-directedness. But in defining the child they wanted in the family, however, they listed emotional stability, moral character and social skill . . . factors not associated with giftedness.

Teachers defined the gifted child in the same way, namely: IQ, good marks, creativity. They would prefer children of these same qualities in class-

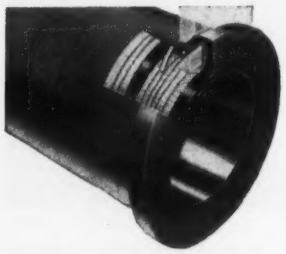


CONDOR RUBBER PIPE used for Largest Under-Water Waste Disposal System

A large chemical plant has installed 1864 feet of 12″ diameter Condor Flexible Rubber Pipe in the lower Delaware River to discharge process wastes from shore to the river channel. Condor Rubber Pipe provided flexibility to permit bolting 50′ lengths together on the deck of the dredge and laying them into a trench in the river bottom. This was easier than bolting or welding a metal pipe-line under water . . . and the rubber pipe will last longer than metal against salt water corrosion outside; nitric and sulfuric acid wastes inside.

Condor Flexible Rubber Pipe outlasts steel 3 to 10 times. It is made in types to withstand pressures up to 250 psi. Installation is easy, economical—and there's no danger of leaky joints at pipe bends. New Hydro-Lok built-on flanges offer full sealing surface *plus* advantage of sure alignment and easy rotation of pipe to equalize wear—*without* removing flange bolts.

Let an R/M representative give you details on Condor Flexible Rubber Pipe . . . or write today for Bulletin 7152.



- Steel Pressure Ring molded into Hydro-Lok Flange
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- Multiple plies of heavy duck
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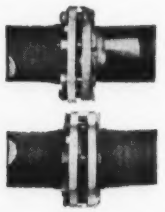
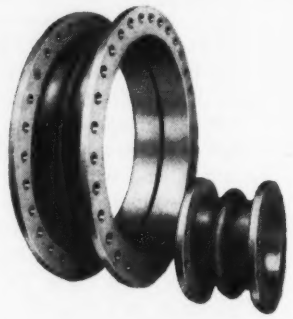


Hydro-Lok Flanges may be used with equal ease to couple rubber pipe to iron pipe with standard flanges (top) or existing sections of rubber pipe using other flanges.



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ENGINEERED RUBBER PRODUCTS ... MORE USE PER DOLLAR

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rooms. But when it came to predicting success in life, their teachers listed: Social skill, goal-directedness, and emotional stability — likewise omitting reference to "giftedness."

The researchers conclude the teacher appears to be saying: "The children who are gifted are the children I like to teach, but not the ones I feel will be successful as adults."

That some of this "be nice but not talented" attitude rubs off on the children — both at home and at school — seems certain. For the large majority, this may mean no problem. But for the upper 3% or so of exceptionally gifted young persons, this could mean pressure to submerge their inherent talent in favor of becoming better, more skilled "team players," or — to use an overworked term — "organization men."

If this attitude-pressuring situation is to be reversed . . . and if one takes seriously the complaints of Admiral Rickover and recommendations of James B. Conant, this will receive attention along with other problems such as curricula . . . then a practical question is: "how?"

Doubtless, this will be done through the efforts of many, just as with the vast pattern of improvements **already** made or under way, as cited in the accompanying table.

Make Way for Tomorrow's Uninhibited Intelligence!

Assuming, then, that our national attitudes will change for the better in this regard, does this not raise still another problem: How to accommodate what will then certainly be growing numbers of these young people who, in addition to having been more rigorously exposed to an improved education process, will also have learned the importance of exercising to the highest possible degree their acknowledged and cultivated talent? These paragons may be tough hombres to tame!

One organization, for example, is reported to have

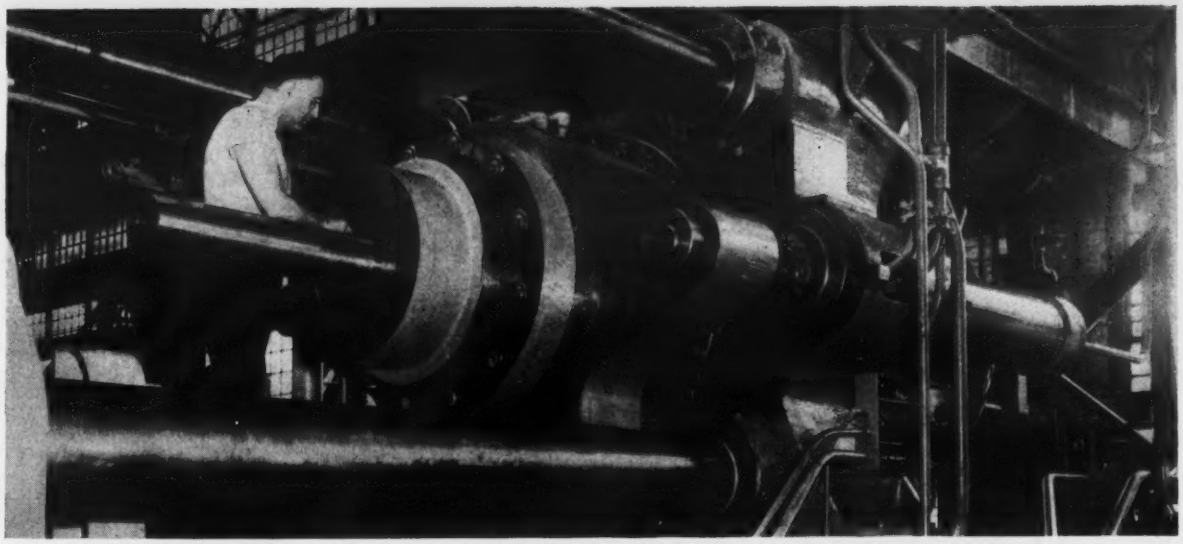
given this problem such serious importance as to begin providing for what might be mis-termed an "elite brain-trust" — based on personal qualities of individuals and not necessarily related to advanced academic degrees. In such a group, such individuals would be set to analyzing assigned areas of the organization's real and possible objectives in what will be as nearly as possible an anxiety-free yet excitement-charged environment.

In other words, it is planned that such individuals will approach some of the most complex and abstract business and engineering problems with the anxiety-free concept that no real obstacles stand in the way of finding practical, although not necessarily desirable, solutions.

Why such emphasis on "freedom from anxiety?" Because "anxiety is diversionary, attritious," comments one industrial consulting psychologist. "Strongest goal-direction is had when anxiety is kept to a minimum.

"An analogy exists in the selection of fighter pilots for the World War II Air Force. When subjected to stress-testing, some pilot candidates had physical reflex failures in reaction to their anxiety-originated strains. Others, however, were observed to function even better than normal under the same stress. So it may be that some scientists and technologists, in approaching the more unusual problems of industry, will be much 'cooler' than their fellows."

One wonders whether companies mobilizing such "advanced problem groups" will be able to get their anxiety-free personnel just for the searching. Or will it be necessary for employers to undertake programs for relieving their most promising scientific and technological employees of their anxieties that are brought to and generated in the work-place . . . much the same as many corporations are increasingly doing for their top-echelon executives? ■



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CREATIVITY & SURVIVAL

NO. 5 IN A SERIES*

All of us, whatever our field of endeavor — be it research, production, engineering or some other phase of CPI technical work or management — would like to become more creative. Here are some suggestions on —

How to achieve that 'FLASH OF GENIUS'

GORDON WEYERMULLER, Associate Editor, Chemical Business

Stages in Creative Process

1 — Preparation

Includes broad reading, note-taking, literature searching, attempts to arrive at a solution

2 — Incubation

Involves putting the problem aside or working on it less while the subconscious takes over

3 — Illumination

"Flash of genius" which provides solution occurs only after extensive work and thought has been given to problem

4 — Verification

Don't overlook this. Your "flash of genius" may be a "flash in the pan"

CREATIVITY is being emphasized much more today, not only in research, but also in engineering and other fields. The U. S. Government is stressing its importance in the struggle against communism. Companies are taking steps to stimulate it by providing a more creative climate.

Although the proper climate may be furnished by research directors, sometimes one must help supply a suitable environment himself. Dr. Morris I. Stein, of the Graduate School of Psychology, New York University, has this to say on the subject:

"There are certain environmental prerequisites for creativity. Materials, equipment and personnel must coincide in some fashion with knowledge and ideas before creative products can appear. At times an individual may find himself in possession of all the prerequisites, but at other times he must help create the necessary environment for himself. He may have the ideas, but he must also find the means for assembling the other necessities. In other words, the individual must gain the opportunity to be creative."

Joseph G. Mason, in his recent book, "How to Be a More Creative Executive," says that to be creative, a person must develop an inquisitive mind. After making a careful study of his job, he should ask himself: What am I doing? Why does the company want me to do it? Isn't there an easier way? To point up the idea, Mr. Mason calls on the Greek philosopher, Heraclitus, who said: "You will never find the unexpected unless you are looking for it."

Although a suitable environment and an inquisitive mind are important to an individual engaged in work of a creative nature, there are a number of other things he can do to become more creative. That "flash of genius" isn't quite like a bolt out of the blue but occurs only after intensive preliminary work. Even after that, work must be done to prove the value of the idea and make sure it was not just a "flash in the pan."

Before the creative process is started, an individual must recognize and define the problem. Although not usually considered a part of the creative process, recognition of the problem certainly has creativity involved in it. After he understands the problem, a person must then have a strong desire to solve it. This motivation is quite important.

At this point if you do not feel very enthusiastic about the problem, consideration should be given to requesting that it be assigned to someone else. In chemical research, the research director tries to anticipate this by assigning problems to an individual that dovetail with his interests. Of course, one should consider that he will undoubtedly develop more interest in a problem as he works on it. With the problem defined and accepted as one he will try to solve, an individual can now start on the creative process.

The creative process can be broken down into the four

*Previous articles in a series on Creativity & Survival appeared in October 1960 issue, page 25; November 1960, page 43; December 1960, page 36; and February 1961, page 33.

stages of preparation, incubation, illumination and verification. Although these stages may not always be distinct and frequently overlap, consideration of them can be valuable in increasing your creative output. Let's discuss what a person can do to improve his creative performance, starting with the first step, that of preparation.

Preparation Should Be Broad

Although one should have a detailed knowledge of his specialized field, he should try to develop broad information in many fields. For example, people working in instrumentation of chemical plants have found it profitable to read publications telling about instrumentation in aircraft, missiles and rockets.

Time should be set aside to read in many fields. Notes and clippings that might have possible application to one's work should be kept and filed. It is valuable to travel widely, attend conventions and meetings, and visit other companies whenever possible.

In addition to this broad background preparation, one must, of course, prepare himself specifically to tackle the problem at hand. The dilemma must now be faced as to how one should review the literature on the subject of the problem.

Dr. Vladimir Haensel, director of process research, Universal Oil Products Company, suggests:

"Now we have two opposing forces in preparing ourselves to tackle the problem. One states that you should review the background very carefully and the other says use your imagination freely. The only real answer to these two opposing viewpoints is that, in reviewing the literature, this must be done most critically. It should be looked upon as being the spoken word rather than the written word, because we all have the weakness for believing completely the written word, whereas we frequently doubt the spoken word. The disbelieving of the past experience becomes even

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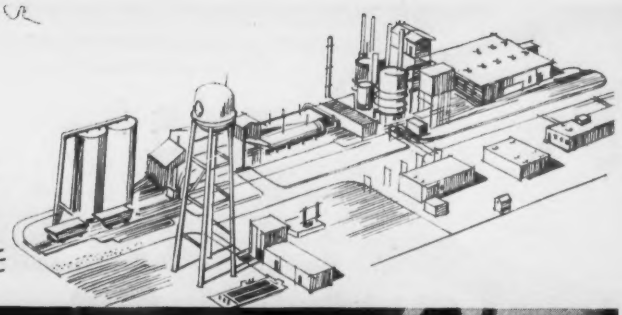
PITTSBURGH CHEMICAL MAKES CARBON NEWS!



New "Big Sandy" Activated Carbon Plant Goes Into Operation

Pittsburgh Chemical's new "Big Sandy" activated carbon plant near Ashland, Kentucky is now in production. This is important news to a constantly growing number of industrial users who depend upon these unique coal-derived materials for superior adsorption in a wide variety of purification, decolorization and refining processes.

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more difficult when the work is your own."

If the field is research, one can now proceed to conduct well-thought-out experiments and analyze the results. At this stage, one often approaches a mental block. A solution appears impossible. This is the point where the second stage, incubation, takes over. Incubation is productive, however, only after extensive work has been done on the problem.

Usually a person is working on a number of problems and now can shift the emphasis on the one problem so that it receives less attention. For incubation, the subconscious should be allowed to come into play, but usually it is not a good practice to drop the problem completely.

Illumination in a Flash

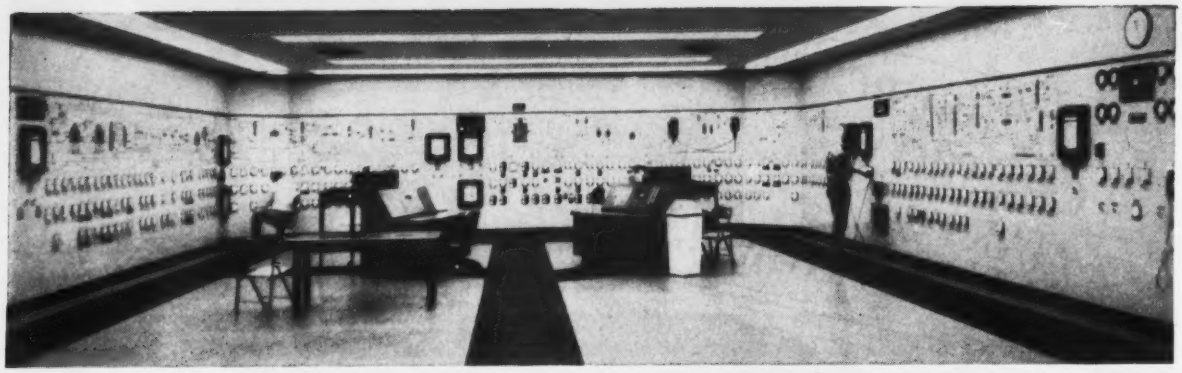
After sleeping on it overnight, taking up other activities on a weekend, or while working on another problem, a person often will find that the solution suddenly comes to him in a "flash of genius." However, everyone agrees that this sudden illumination does not come unless one has thoroughly saturated himself in the problem before hand. No solution can be expected unless considerable information has been supplied to the subconscious.

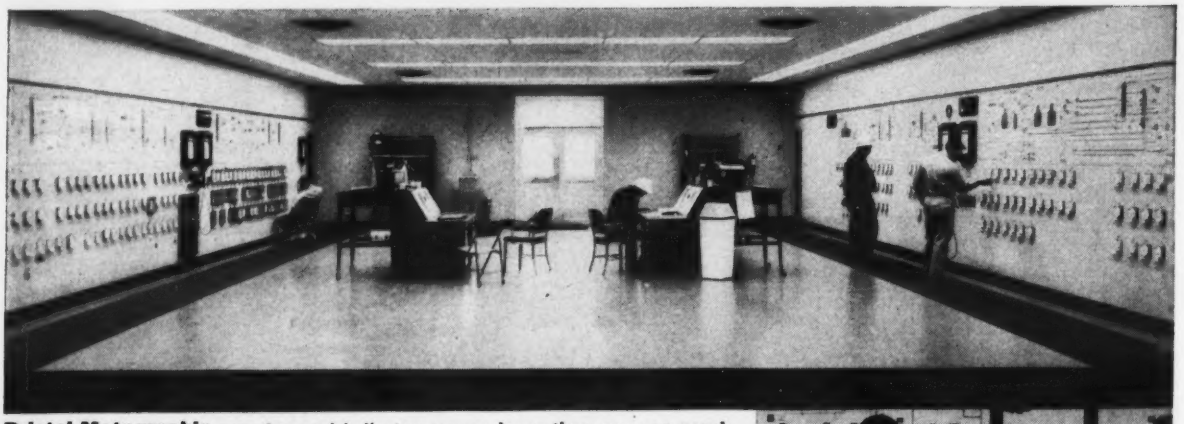
The last and quite important stage is verification or evaluation of the idea or solution obtained during illumination. This is vital since, as Dr. Haensel says, ". . . the flash of genius may be completely wrong."

Verification involves much painstaking work, elaboration and revision. It means a great deal of hard work and is an area neglected by some quite creative people.

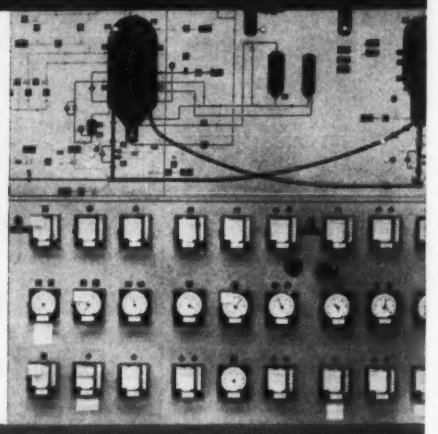
An example is a brilliant man in the plastics field in the Midwest who has more good ideas in a few minutes than some people have in a lifetime. However, it is difficult to get him to concentrate on one idea long enough to bring it to a successful conclusion.

The man who is valuable





Bristol Metagraphic recorders and indicators occupy lower three rows on panel (shown in two photos above). Enlarged panel section is shown below, right.



"NERVE CENTER" AT BIG NEW TEXACO PLANT INCLUDES BRISTOL METAGRAPHICS

This model central control room is the nerve center for a vast petroleum processing complex. It's located in the new Puget Sound Works of Texaco Inc., at Anacortes, Washington.

A key feature of the control system is a battery of several hundred Bristol Metagraphic pneumatic recorders, indicators, and controllers (lower three instrument rows on panel). The new plant produces motor gasolines, jet fuels, liquified petroleum gases (LPG), diesel fuel, furnace oil, and heavy fuel oil. Crude oil capacity is 45,000 barrels per calendar day. o.7

This is just one of hundreds of installations of Bristol Metagraphic instruments in use today in processing plants throughout the country. These compact instruments are ideal for graphic panel use, or where true "plug-in" versatility is necessary to insure maximum control system reliability and continuity of service. We'll be glad to send you the complete Metagraphic story. Write: The Bristol Company, 141 Bristol Road, Waterbury 20, Conn.

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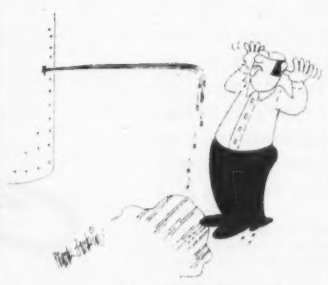
to a company is not just the creative individual but the one who is creative and has the perserverance to follow through on his ideas and bring them to the stage where they are worth while.

Creative Person Not an Oddball

As a last suggestion, it might pay an individual to check on his own characteristics and see if they match those of creative people. Contrary to the public image of geniuses, they are seldom unusual in their personal characteristics. In fact, a research leader of a large chemical company in the Midwest recently said that their company had been fooled a few times by oddballs thought to be creative geniuses in research. After a period of employment, such a person was often found to be an oddball and nothing else.

A recent study showed that the creative scientist usually is well adjusted, independent, articulate, relies on impulses, drives himself hard and is detached from others. He doesn't worry unduly, feel insecure about his job or let personal problems interfere with his work. He is painstaking about detail.

In conclusion, there is no clearcut course to creativity either for a company or an individual. However, there are some guideposts that may help. An individual who wants to be more creative should follow these and seek additional avenues which have led others to the higher levels of creativity. ■



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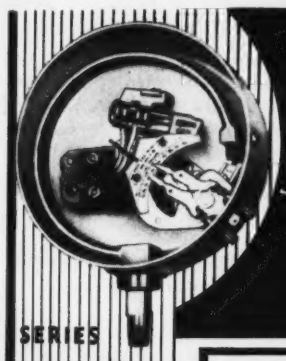

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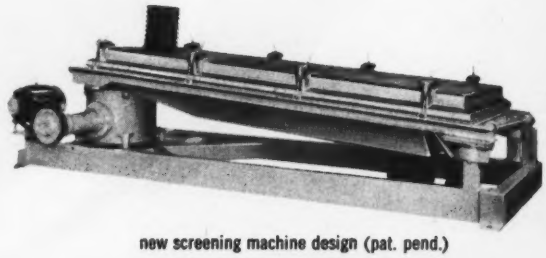

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Celanese CHEMICALS

Check 2856 opposite last page.

Free-flowing polymer adds flame retardancy to polyether foams

Uses: Material is used to add flame-retardant properties to rigid polyether-based urethane foams.

Features: Flame retardant makes only minor changes in properties of foams prepared from a given formulation. Dimensional stability under humid aging conditions is actually improved. Compressive strength at elevated temperatures is not affected.

Description: Material, Niax flame retardant A, is a free-flowing polymer that is dispersed in resin side of foam formulation. Although the greatest effectiveness for flame retardancy is achieved in rigid polyether foam systems based on company's Niax triol LK-380, it can be used to advantage in most rigid foam formulations. Product is available in 10- and 41-gallon Fiberpaks containing 30 and 140 pounds respectively. Prices range from 54¢ per pound in less than drum lots to 47.5¢ per pound for carload or truckload lots.

(Niax flame retardant A is a product of Union Carbide Chemicals Company, Div. of Union Carbide Corporation, 270 Park Ave., N.Y. 17, N.Y.)

Check 2857 opposite last page.

Chlorinated polypropylene is now available

Film-forming polymer, chlorinated polypropylene, has excellent heat-resistant properties and also may be applicable in flame-retardant compounds. Marketed under the tradename Parlon P, product is a white free-flowing powder soluble in many common solvents.

In addition to heat and light stability, chlorinated polymer is said to have excellent solution color, produce clear water-white films and exhibit good chemical resistance.

(Parlon P is a product of Hercules Powder Company, Hercules Tower, 910 Market St., Wilmington 99, Del.)

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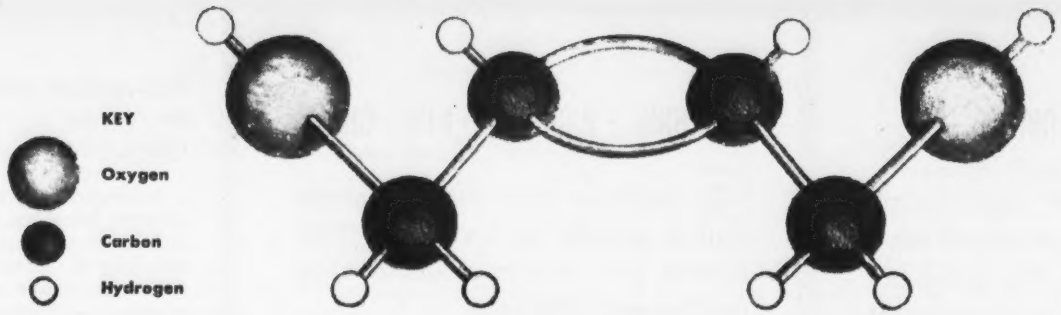


Butenediol—Lab curiosity goes semi-commercial

Initial applications include use as a chemical intermediate for polymers (including polyurethanes and epoxies), herbicides and insecticides. Butenediol compounds offer possible use in the area of soil fumigants, acrylic polymers, flame-resistant resins, poultry-growth agents, and synthetic rubber

UNTIL RECENTLY more or less a laboratory curiosity, butenediol is now available in tankcar quantities, in two grades (technical and purified). Currently the price range is 73 to 93c a lb and as larger scale production is achieved it is expected that these prices will eventually be about 50c a lb.

A new catalytic reduction process has made it possible to produce this olefinic glycol on a commercial scale. It is derived from butynediol which is made by condensing acetylene with formaldehyde under pressure at elevated temperatures. Butynediol is then converted into butenediol which is essentially the *cis*-isomer.

Applications

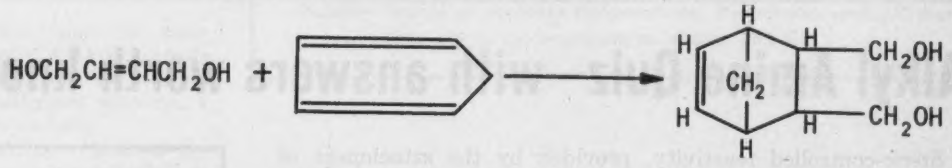
Principal use of butenediol is as a chemical intermediate, a versatile building block in organic synthesis. It reacts both as a glycol and as an unsaturated compound.

Diels-alder addition product of butenediol and hexachlorocyclopentadiene is an important intermediate for the synthesis of pesticides, drugs, textile assistants and plastics. For example, treatment of the Diels-Alder adduct with thionyl chloride gives a cyclic sulfite which is an effective insecticide. On cyclization, the butenediol-hexachlorocyclopentadiene addition product gives the corresponding tetrahydrophthalan derivative, which is reported to be active

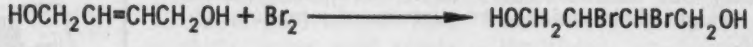
To page 45

Reactions

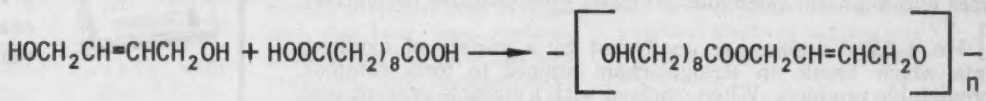
Butenediol can be added to dienes such as anthracene, cyclopentadiene, and hexachlorocyclopentadiene in the Diels-Alder reaction.



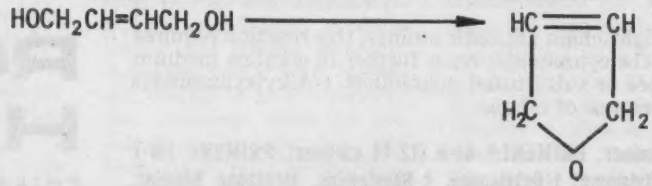
Butenediol adds halogens at the double bond to give dihalobutanediol.



Butenediol forms polyesters by reaction with dibasic acids. For example, butenediol reacts with sebacic acid to form polysebacate.



Butenediol is readily dehydrated to dihydrofuran.

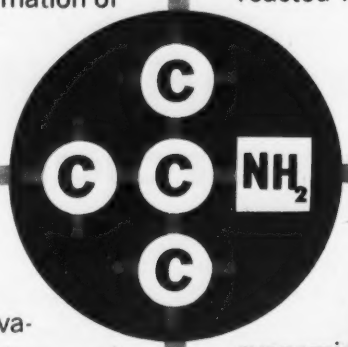


$$t\text{-}RNH_2 \longrightarrow t\text{-}RNH\text{-}R'$$

1 Amino-Hydrogen Substitution of a t-Alkyl Amine. In many such reactions, why is a secondary amine obtained readily, with little formation of tertiary amine?

$$t\text{-}RNH_2 + R'CHO \longrightarrow \underset{\text{t-alkyl aldimine}}{t\text{-}RN{=}CHR'}$$

2 Reaction with Aldehydes. Do t-alkyl amines and straight-chain amines give similar products when reacted with aldehydes?



3 Oxidation to Nitro Derivatives. Can both t-alkyl amines and straight-chain amines be readily oxidized to nitro derivatives?

$$RNH_2 \xrightarrow{[O]} RNO_2$$

4 Preparation of t-Alkylcyanamides. In this reaction, would you expect a higher yield if you used a t-alkyl amine instead of a straight-chain amine?

$$t\text{-}RNH_2 \xrightarrow[NaOH]{Cl_2} [t\text{-}RNHCl] \xrightarrow{NaCN} t\text{-}RNH\text{-}CN$$

t-Alkyl Amine Quiz—with answers worth knowing...

1 Steric-controlled reactivity, provided by the attachment of amino group to a tertiary carbon, permits one amino hydrogen to be substituted easily but retards tertiary amine formation. Similar reactions with straight-chain amines give mixtures of secondary and tertiary amines.

2 No. t-Alkyl amines react with many alkyl and aromatic aldehydes to form stable aldimines, also called Schiff bases. Straight-chain amines and aliphatic aldehydes normally give unstable derivatives.

3 No. t-Alkyl amines are unaffected by a variety of oxidizing agents which break up straight-chain amines to form complex, unpredictable products. When oxidized with a suitable reagent such as potassium permanganate, however, t-alkyl amines undergo clean reactions to tertiary nitroparaffins.

4 Yes. With straight-chain aliphatic amines, this reaction requires close control, since the cyanamides react further in alkaline medium to form isomelamines or substituted guanidines. t-Alkylcyanamides are stable in the presence of a base.

Rohm & Haas t-alkyl amines: PRIMENE® 81-R (12-14 carbons), PRIMENE JM-T (18-22 carbons), t-Butylamine, t-Octylamine, t-Nonylamine, Menthane Diamine.

Write to Dept. SP-12 for samples and a 44-page book giving many reactions of t-alkyl amines.

ROHM & HAAS

PHILADELPHIA 5, PA.

Check 2859 opposite last page.

CHEMICAL MATERIALS

FDA-exempt latex for coating paper cups

A film-forming styrene copolymer latex has been introduced for coating paper and paperboard, drinking cups, disposable containers and food packages. Designated Lytron 6A, it has been exempted from the provisions of the Food Additive Amendment for coating paper cups, plates and other single-surface containers used in the home. The Food and Drug Administration is expected shortly to confirm its use for general food packaging.

Material is said to provide a continuous, non-blocking, clear coating with excellent resistance to hot and cold liquids as well as grease and oils. It is odorless, tasteless and non-yellowing. Applications can be by spray, flush or web coating with conventional equipment and procedures.

(Lytron 6A is a product of Monsanto Chemical Company, Plastics Division, Springfield, Mass.)

Check 2860 opposite last page.

Five nonionics added to company's line of surface actives

Five nonionic surface active agents have been added to manufacturer's line, bringing the total to 20.

Three of the products are based on dodecyl phenol, Tergitol nonionics 12-p-6; 12-p-9; and 12-p-12. Two are based on trimethyl nonanol, Tergitol nonionics TMN-3 and TMN-10.

All products are adducts with ethylene oxide. Those with fewer mols of ethylene oxide are aromatic and aliphatic hydrocarbon soluble. As ethylene oxide ratio increases, products become more water soluble.

(Tergitol nonionic surface active agents are products of Union Carbide Chemicals Division, Union Carbide Corp., 270 Park Ave., N.Y. 17, N.Y.)

Check 2861 opposite last page.

Butenediol—

From page 43

as a biological toxicant. The tetrahydrophthalan derivative may be chlorinated to give compounds with high insecticidal activity.

The tetrahydrophthalan derivative may also be brominated to a 1-bromo derivative which reacts with alcohols and phenols to give a series of products reported to be useful as pesticides, drugs and intermediates. The butenediol-hexachlorocyclopentadiene adduct is also reported to be an intermediate for flame-resistant polyester resins.

ESTERS

Esters of butenediol are also useful in a variety of applications. Monoesters, diesters and mixed esters obtained by reacting butenediol with halo substituted acetic acids have been found to act as fungicides, herbicides, germicides.

Esters obtained by reacting butenediol with higher aliphatic acids — lauric acid, for example — have been reported useful as plasticizers for synthetic resins and as intermediates for textile assistants.

Butenediol can be reacted with methacrylic acid to give 2-butene-1,4-dimethacrylate which is an effective crosslinking agent for acrylics, styrene and other monomers.

A polyester film may be prepared by esterifying methyl vinyl ether-maleic anhydride copolymers with butenediol to yield a polyester which reacts with N-vinyl-2-pyrrolidone in the presence of heat. Components are mixed and applied in water solution to wood, metal, glass or cloth, followed by drying and a short bake at 130-210°C.

Phosgenation of butenediol gives a reaction product which can be further reacted with mono- or polyhydric alcohols to yield high molecular weight polycarbonates.

The partial ester obtained by reacting butenediol with triallyl cyanurate or a similar unsaturated ester of cyanuric acid may be copolymerized with vinyl monomers or unsaturated alkyd resins.

The N,N'-disubstituted diurethane can be prepared from butenediol bis-(chlorocarbonate) and novocaine. Products of this type are reported to possess anesthetic action without the undesirable side effects of procaine.

The reaction of butenediol with urea gives butenediol dicarbamate. This type of product has been found useful in the dye industry and in medicine.

ETHERS

The bis (α-methylbenzyl) ether of butenediol, which can be prepared by condensing the diol with styrene, is claimed to be a plasticizer for chlorine-containing vinyl resins such as vinyl chloride polymers and copolymers.

POLYURETHANES

Butenediol is reported to be of use in a polyurethane having special properties as a synthetic rubber with over 300% elongation, 4200-5700 psi tensile strength and more than 30% elasticity.

OTHER DERIVATIVES

Butenediol may be converted to 1,4-dicyano-2-butene which can be reduced to hexamethylene diamine, a nylon intermediate.

Dihydrofuran, obtained by dehydration of butenediol, is an intermediate for the preparation of α-amino-γ-hydroxyvaleric acid, a growth promoting agent for poultry.

Copolymers of butenediol with vinyl esters have been reported useful as reactive plasticizers or as components of various synthetic resins.

Butenediol reacts with acrylonitrile to give 3,3'-(2-butylene-1,4-dioxy) dipropionitrile. Possible applications for this type product include such functional fluids as lubricants, heat transfer agents, refrigerator fluids or radiator fluids for internal combustion engines.

Butenediol condenses with diethyl carbonate in the presence of sodium ethylate to form 2-butene-1,4-diol bis (ethyl carbonate), which can be polymerized to give hard products having good resistance to weather, light and heat.

Butadiene dioxide, which is readily prepared from butenediol, has been used successfully in tanning baths and as a cosolvent, with tetrahydrofuran, for high molecular weight polyvinyl chloride. It reacts with glycols and diamines to give crosslinked products which later become insoluble. Benzidine reacts with butadiene dioxide to give a cement-like substance after 24 hrs. Butadiene dioxide has also been used as a crosslinking agent for wool fibers and cotton fibers.

Physical Properties

Butenediol technical contains approximately 92% 2-butene-1,4-diol and the purified grade contains approximately 95% 2-butene-1,4-diol which is predominately the *cis*-isomer. Other organic materials present in both grades are 2-butyne-1,4-diol and 1,4-butanediol.

	Butenediol Technical	Butenediol Purified
Appearance	Clear amber liquid	Almost colorless liquid
Solidification Point	7.0°C	8.5°C
Boiling Range (20mm Hg) (0.5% to 99.5%)	141-149°C	142-147°C

Properties Common to Both Grades

Odor	Essentially odorless
Viscosity (20°C)	22 cp
(38°C)	10.8 cp
(99°C)	2.5 cp
Refractive Index nD^{25}	1.475-1.477
Specific Gravity (25/15)	1.067-1.074
Flash Point (Cleveland Open Cup)	263°F
Fire Point (Cleveland Open Cup)	260°F

Solubility: Very soluble in water, methanol, ethanol and acetone. Soluble in benzene with difficulty

Stability: Stable at ordinary temperatures. Dehydrates and polymerizes slowly at temperatures above 165°C

Technical-grade butenediol may be used in applications where color is not of prime importance, or where color bodies are removed during processing. The purified grade is almost free of color bodies and thus is preferred over the technical grade in applications where lack of color is of prime importance.

Additional application, reaction data and an extensive bibliography are available from the manufacturer.

(Butenediol is a product of Commercial Development Dept., The Chemical Group, General Aniline & Film Corporation, 435 Hudson Street, New York 14, N. Y.)

Check 2862 opposite last page.

NALCAMINE® G-39M

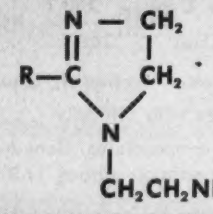
...This low cost fatty diamine makes high quality corrosion inhibitors!

Here's Why!

- It is strongly adsorbed on metallic surfaces . . . Contains *two* cationic centers, making it a really powerful surface active agent.
- It is *readily pourable*, for easiest handling.
- It exhibits excellent stability in corrosive environments.
- It is soluble in hydrocarbons . . . as the free diamine or as its salts of high molecular weight acids.
- It makes normally water-accepting surfaces oil wettable.
- It can be alkylated, oxyalkylated, quaternized or converted to salts of acids by neutralization.

Nalcamine G-39M has been designed expressly for use in products where pharmaceutical purity and color are not required. Thus it offers you all these important properties for a top corrosion inhibitor at a really *down to earth cost!*

THIS IS NALCAMINE® G-39M



Nalcamine G-39M is a mixture of diamino imidazolines, consisting predominantly of the diamine shown above where the mixed alkyl chains are heptadecenyl and heptadecadienyl.

TYPICAL ANALYSIS

Apparent Molecular Wt.	422
Apparent Combining Wt.	211
% Imidazoline	94.0
% Titratables	99.2
Spec. Gravity at 60°F.	0.948
Pour Point °F.	25
Viscosity at 60°F. cps	334
Density—Lbs. per gallon	7.91
Color	Black

SHIPPING

Nalcamine G-39M is shipped in fifty-four gallon, bung, unlined, non-returnable steel drums. Weight of each drum is approximately 420 lbs.

HANDLING

Nalcamine G-39M can be handled or stored in iron or mild steel. It should be stored in a closed container.

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In Canada—Alchem Limited, Burlington, Ontario

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Check 2863 opposite last page.

CHEMICAL MATERIALS

Obtain high resistance to abrasion, corrosion with dense ceramic

Uses: Developed originally for radome applications, material should be of importance for more advanced designs in electrical and electronic applications. It should merit investigation in other areas where hardness, chemical inertness and high-temperature strength are required.

Features: Absence of silica gives material particularly high resistance to corrosion even at elevated temperatures. With a Rockwell (45 N scale) hardness of 80, it is extremely resistant to abrasion.

Description: Material, Coors type AD-995, is a high-strength, vacuum tight 99.5% aluminum oxide ceramic. Dielectric constant is 9.27 with a loss factor at room temperature of 5.5×10^{-4} at 9200 Mc. Flexural strength at 2000°F is 28,900 psi. Maximum working temperature is 3200°F.

(Coors AD-995 aluminum oxide ceramic is a product of Coors Porcelain Company, 600 Ninth St., Golden, Colo.)

Check 2864 opposite last page.

Two self-extinguishing epoxies announced

Products retain properties of conventional epoxies

Uses: Resins should find use in laminated structures, filled castings, adhesives and coatings.

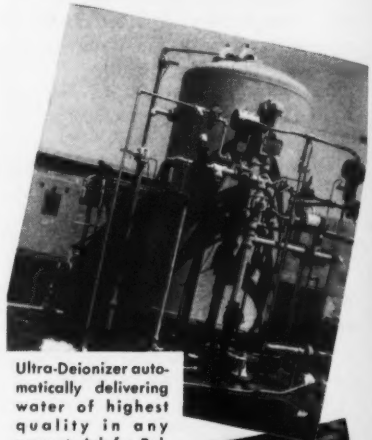
Features: These two resins are made self-extinguishing through bromine substituted on the epoxy molecule. They are cured or hardened with common epoxy curing agents.

Description: Physical and electrical properties of castings and laminates made with these resins are comparable to properties developed by conventional epoxy resins. Modulus properties are reduced at 300°F, but blends with manufacturer's epoxy novolac resin are expected to result in higher modulus at elevated temperatures.

Experimental resin X-3442

These ELGIN DEIONIZERS *cover every need for* MINERAL-FREE WATER

Whatever *quality* of water you require—even up to 18,000,000 ohm purity—there is an Elgin Deionizer that will deliver it. Whatever *quantity*—from smallest laboratory to largest needs—there are Elgin Deionizers like those illustrated below that will exactly fit your requirements. Write for bulletins.



Ultra-Deionizer automatically delivering water of highest quality in any amount. Ask for Bulletin 512A.

Multi-column Deionizer built in all anion and cation exchanger combinations. Ask for Bulletin H4.

Small mixed bed deionizer with exchangeable refill that eliminates regeneration. Gives 120 GPH of water that is chemically purer than distilled water. Ask for Bulletin 513.

ELGIN SOFTENER CORPORATION

180 N. Grove Ave., Elgin, Illinois

Representatives in Principal Cities

In Canada: G. F. Sterne & Sons, Ltd., Brantford

Check 2865 opposite last page.

is a semi-solid containing about 49% bromine. Initial price on this resin will range from $1.25 to $2.01/lb.

Experimental resin X-3441.1 is a solid resin containing about 19% bromine. It can be used either alone or in blends with conventional solid resins. This resin will be priced from $1.00 to $1.76/lb.

(Self-extinguishing epoxy resins X-3442 and X-3441.1 are products of Dow Chemical Company, Midland, Mich.)

Check 2866 opposite last page.

Viscous material filtered with fast flow rate filter aid

Diatomite filtered aid having a flow rate nearly double that of the fastest available filter aid materials has been developed. Called Celite 560, it makes possible the filtration of extremely viscous materials that could not previously be filtered because of too low a permeablility.

Product should prove useful in the manufacture of plastics, resins and synthetic fibers and films.

(Celite 560 is a product of Johns-Manville Corporation, 22 East 40th St., New York 16, New York.)

Check 2867 opposite last page.

For more efficient sulfations and sulfonations **99.5% available SO_3**

GENERAL CHEMICAL

SULFAN®

the stabilized sulfur trioxide that's backed by 10 years of application experience

General Chemical SULFAN offers you many significant advantages—in use, in service, in supply.

The unique form and properties of SULFAN—99.5% available SO_3 in easy-to-handle liquid form—enable you to step up operating efficiency, to run larger batch sizes, and to get more rapid through-put . . . often *double* in the same equipment. No spent acid disposal problems, either!

You also get the benefits of General's 10 years of experience with stabilized SO_3, for all types of application. Our technical service specialists can really show you where, when and how to cash in on SULFAN for *your* operation.

A further and not inconsiderable advantage you get with SULFAN is dependability of supply. As the only supplier of stabilized sulfur trioxide with multiple producing locations, General Chemical can provide better service... assurance that your schedules can be met!

Learn more about SULFAN now. A letter outlining your particular requirements will bring information of immediate practical value! Or mail coupon for free technical brochures.

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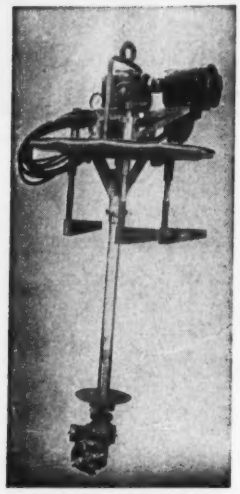
Check 2868 opposite last page.

This man, cleaning a tank-truck interior of alkyd resin deposits, accomplishes



Oakite Interior Tank Cleaning Unit, Model 531. Automatically sprays hot cleaning solution under pressure. Nozzles rotate vertically and horizontally. Rinses after cleaning. Sprays 45 gal/min at 150 lbs. pressure.

18 hours cleaning in 1 hour

At a New England chemical plant, it used to take three men working six hours to clean out each truck tank—two men inside the tank scrubbing, scraping and sloshing, one man astride the dome to watch in case the oxygen tanks gave out. Even at that, a careful inspection was needed to make sure the tank was properly clean.

That's how it *was*. Now, one man equipped with the Oakite 531 Interior Tank Cleaning Unit, using a cleaning solution recommended by the local Oakite representative, does the whole job in one hour flat. A sweet job, too, with the tank interior shining like new.

It's just one of the many ways Oakite methods and materials save time and money in chemical plants . . . and why you may find it well worth your while to call in your local Oakite man. Meanwhile, for details about Oakite tank cleaning equipment and Oakite cleaning methods for the chemical industry, write to Oakite Products, Inc., 16H Rector Street, New York 6, N. Y.

Technical Service Representatives in Principal Cities of U. S. and Canada

Export Division Cable Address: Oakite

OAKITE

over 50 Est. 1909 SCIENCE years' leadership in industrial cleaning

Check 2869 opposite last page.

CHEMICAL MATERIALS

Chemically inert high polymer processes easily

High performance thermoplastic, vinylidene fluoride resin, can be formed by all useful where mechanical strength, resistance to chemical attack and elevated temperatures are important

CONTINUING RESEARCH in fluorine chemistry has resulted in the development and introduction of a new fluorine-containing polymer. Preliminary tests of this new vinylidene fluoride thermoplastic resin show that it has long life and high performance in unusual environments.

The product, known as Kynar, is a high-molecular-weight polymer of vinylidene fluoride, $(CH_2\text{-}CF_2)n$, containing over 59% fluorine by weight. The resin is available as a molding powder, pelletized resin, dispersion, or solution in semi-commercial quantities. Its properties are strongly influenced by the inherent stability and inertness characteristic of highly fluorinated molecules.

Uses for the parts fabricated from the resin are in those fields where mechanical strength and toughness, chemical resistance, weatherability and thermal stability are important.

In chemical and food processing operations, such equipment parts are useful as seals

Physical Properties

Clarity	transparent to translucent
Specific gravity	1.76
Molding temperatures	400-550°F
Mold shrinkage	0.020 in/in
Machining qualities	excellent
Flammability	self extinguishing
Tensile strength, 77°F	7000 psi
Tensile strength, 212°F	5000 psi
Elongation, 77°F	300%
Elongation, 212°F	400%
Yield point, 77°F	5500 psi
Yield point, 212°F	2500 psi
Modulus of elasticity, 77°F	
in tension	1.2×10^5 psi
in flexure	2.0×10^5 psi
in compression	1.2×10^5 psi
Izod impact, unnotched, 77°F	30 ft-lb/in
Durometer hardness	80, Shore D scale
Heat-distortion temperature, 66 psi	300°F
Heat-distortion temperature, 264 psi	195°F
Abrasion resistance, Tabor	
CS-17, ½ Kg load	17.6 mg/1000 cy
Water absorption	0.04%
Low-temperature embrittlement	−80°F
Thermal-degradation temperature	650°F
Radiation resistance, Co-60	100 mega rep

Dielectric Properties

	60 cy	10^3 cy	10^6 cy
Dielectric constant	8.4	8.0	6.6
Dissipation factor	0.049	0.018	0.17
Volume resistivity, ohm-cm		2×10^{14}	
Dielectric strength, volts per mil			
1/8" thickness, short-time		260	
0.008" thickness, short-time		1280	

and gaskets, valve and pump parts, diaphragms; impellers; seats and plugs; translucent tubing; heavy-wall unsupported pipe and fittings; and as linings for pipe, fittings, valves and pumps, tanks and autoclaves.

In packaging applications the product may be used for drum and container coatings and liners; tough, glossy films for packaging and hermetically sealing chemicals, lubricants and propellants; sterilizable packaging media for foods, pharmaceuticals and medical instruments.

Protective-coating and insulation applications include: film laminated to metals, wood and other plastics for protection from weather and chemicals; extruded jackets and prime insulation for high-temperature wire insulation; coatings and saturants over fabrics and braids for tarpaulins; hose and wire insulations.

Resin Forms

In powder form the product is white, has a bulk density of 30 lb/cu ft, is free-flowing and non-hygroscopic.

As a pellet it is off-white, opaque, and has a bulk density of 60 lb/cu ft. The pellets are cylinders measuring approximately 1/8" long x 1/8" diam.

As a dispersion it is in the form of a stable suspensoid of fine resin particles (1-10 microns) in high-boiling organic liquids. A clear solution in an organic solvent is also available.

Physical Properties

The more important mechanical properties of Kynar include high tensile and compressive strength, high impact strength and low cold-flow characteristics. It is flexible in thin sections for film and tubing applications, and rigid in heavy sections where load-bearing characteristics are important.

The polymer's useful temperature range is broad: from below −80 to above 300°F. Its crystalline melting point, 340° F, permits fabrication at reasonably low temperatures.

Products made from Kynar are resistant to attack or penetration by most corrosive chemicals and organic solvents, including mineral acids, oxidants, alkalis, halogens and hydrocarbons. Strongly polar solvents, such as dimethyl acetamide, tend to dissolve the polymer. Certain strongly basic primary amines, such as n-butylamine, react with the resin to form dark, brittle products.

In a series of tests of a five-milfilm immersed for 30 days at 122°F, tensile strength loss was relatively low. For example, the control showed a tensile strength of 7200 psi . . . and the greatest loss in tensile strength (to 4800 psi) occurred only when the film was immersed in phosphorous oxychloride and in pyridine, both very severe services. Forty-one less severe tests showed considerably less reduction in tensile strength.

Electrical Properties

The resin has high dielectric strength in thin films, an unusually high dielectric constant, and a high dissipation factor. Its dielectric strength, in combination with mechanical strength, flexibility, thermal stability and inertness to chemicals and weather, sug-

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Pastry mixing
Rubber or plastic hardening
Metal finishing coolant
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Instrument testing
Fire extinguishing
Inert gas blanket and purging
General refrigeration uses
Carbonation
Chemical uses

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Chemical Corporation
Chemicals Division, Baltimore 3, Maryland

8855

Check 2870 opposite last page.

gests such applications as thin-wall primary insulation and jacketing for specialty hook-up and control-wire and motor windings.

Fabrication

Product is readily compression-molded into sheets, gaskets, rods and other shapes. Its low thermal conductivity and relatively high melt viscosity are factors to be considered when choosing molding conditions. Resin's high stability at molding temperatures allows complete thermal conversion without degradation.

Standard injection-molding procedures may be followed in using the product, without making major modifications. Materials contacting molten polymer should be constructed of chrome-plated hardened steel or type 316 stainless steel.

Extrusion into shapes, rod, tubing, sheet, wire coating and cable jackets may be accomplished. Long-barrel (L/D of 20/1) extruders, using nickel-alloy liners and stainless or chrome-plated steel dies and screws, are recommended. Conventional polyethylene screw design (constant pitch, varying root diameters leading to a shallow metering section) has given satisfactory results.

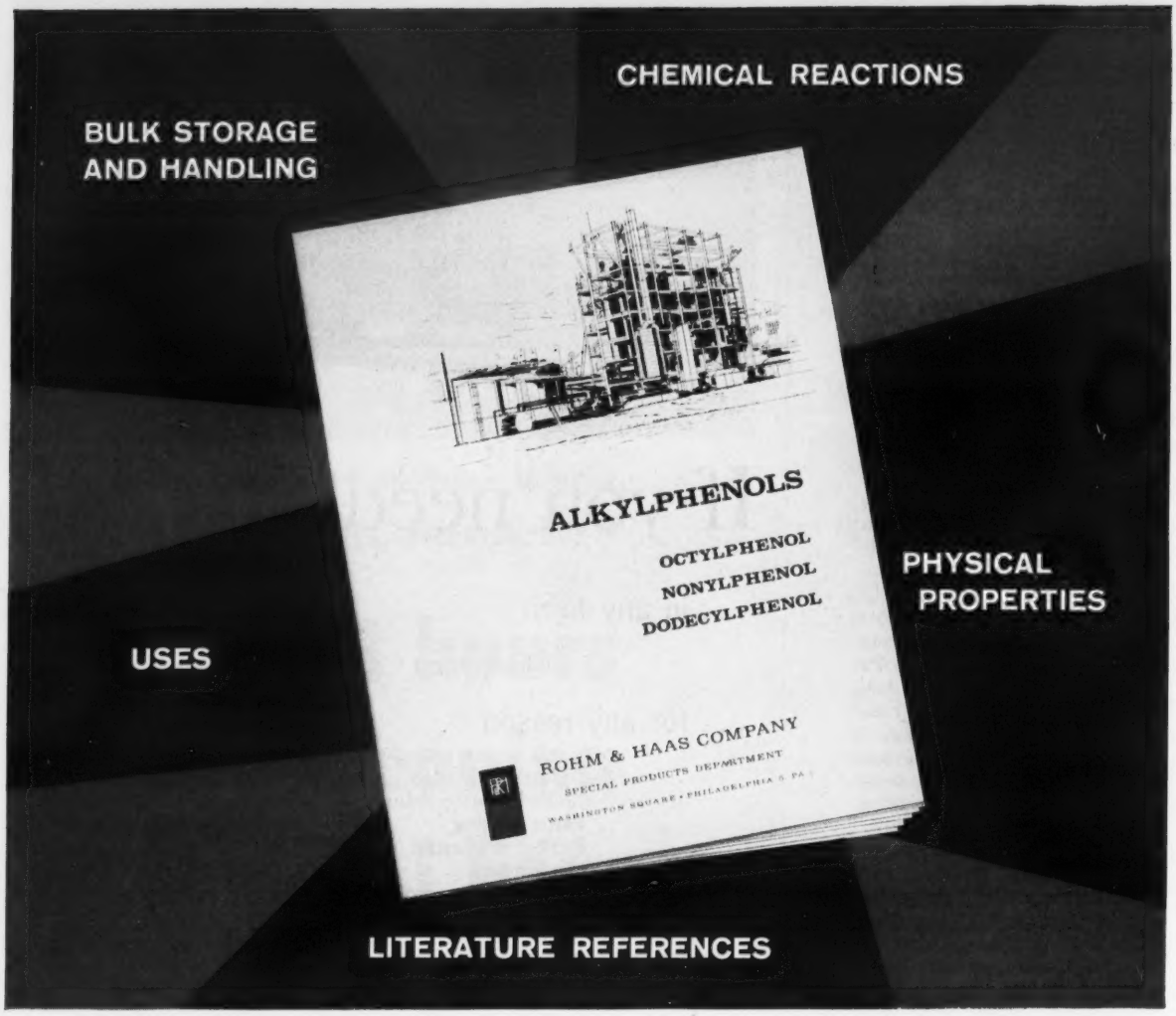
Resin dispersions are similar to plastic organosols in their manner of application. Presence of latent solvents permits the formation of continuous films at temperatures lower than the crystalline melting point of the polymer.

Optimum strength is obtained only after completely fusing the polymer film at 370-420°F. Spraying, casting or dipping are standard techniques used. Thickness as per pass are not limited to critical values.

(Kynar is a product of Pennsalt Chemicals Corporation, 3 Penn Center, Philadelphia 2, Pennsylvania.)

Check 2873 opposite last page.

For more information on developments in this section, check the Reader Service Slip.

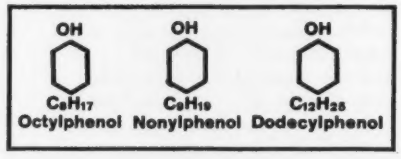


Working guide to the alkylphenols

Low cost and a wide range of useful reactions make alkylphenols valuable intermediates for many types of products.

To help you explore the possibilities of octylphenol, nonylphenol, and dodecylphenol, Rohm & Haas offers this bulletin. It provides data on physical properties, storage and handling, applications, and detailed information on many reactions. These reactions include etherification, condensation with aldehydes and sulfur halides, salt formation, sulfonation, nitration, halogenation, and esterification.

Write to Dept. SP-10 for your free copy of this 18-page booklet. Samples of the three Rohm & Haas alkylphenols are also available.



ROHM & HAAS
PHILADELPHIA 5, PA.

ALKYLPHENOLS

Check 2871 opposite last page.

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U.S.I. CHEMICAL NEWS

★ A Series for Chemists and Executives of the Solvents and Chemical Consuming Industries ★

Cesium Metal Is Now Being Produced by U.S.I.

Cesium metal, 99%+ pure, is now available in commercial quantities from U.S.I. Production facilities can turn out 50-75 pounds per week. Current price is pegged at $100 per pound in 1, 5, or 20 pound cylinders. Substantially larger quantities could be produced if new, large-volume applications should develop.

Cesium is currently used in minute quantities in TV cameras and electron multiplier photoelectric cells. Many potential applications are based on cesium's ability to ionize easily. Because of this, it may some day be needed in large volume for thermonuclear converters based on plasmas, and as a propellant in ion propulsion motors for space ships. Other less exotic applications for cesium include: grain refining agent for other metals such as aluminum; heat transfer

MORE

ATTENTION: Ethyl Alcohol Users

The Internal Revenue Service of the U.S. Treasury Dept. has issued Publication No. 443 (9-60), covering current regulations on "Distribution and Use of Denatured Alcohol and Rum". Publication No. 444, issued at the same time, covers "Distribution and Use of Tax-Free Alcohol". Both booklets can be obtained, at a cost of 25¢ each, from the Superintendent of Documents, U.S. Government Printing Office, Washington 25, D. C.

The information contained in these booklets has been summarized in the new Government Regulations Supplement to the U.S.I. Ethyl Alcohol Catalog, offered in the November Chemical News. Because of great demand, this supplement has been reprinted and revised to contain all regulations changes up to Dec. 1, 1960. Copies of the Regulations Supplement and the Alcohol Catalog may be obtained from Technical Literature Department, U.S.I. Chemical News, 99 Park Avenue, New York 16, N. Y.

Naphthalene Shortage Eased By Sale of Mixed Streams

Shortage May Be Eased Further by Use of Economical Sodium Desulfurization Process for Mixed Streams.

Coal tar naphthalene suppliers are now making mixed streams—naphthalene plus isomers—available to phthalic anhydride producers. Isomers can also be converted to phthalic, although yield is lower than for straight 78° naphthalene, and some processing problems are encountered.

Other Solutions to Shortage

This is the first step in easing the naphthalene shortage resulting from low steel production. Suppliers are also working on maximum conversion of coal tar to naphthalene and isomers, even at the expense of tar acid, solvent and creosote production. Also, more petroleum naphthalene capacity is being built.

According to one report, mixed streams can be used by phthalic producers only in fixed-bed processes. These streams must be desulfurized further for fluid-bed use. Consequently, further easing of the situation might result from use — by mixed-stream suppliers and/or phthalic makers —of an economical desulfurization process recently developed by U.S.I. Investigations are currently underway.

Desulfurization Process Uses Sodium

This is a semi-continuous, commercial process for desulfurization through

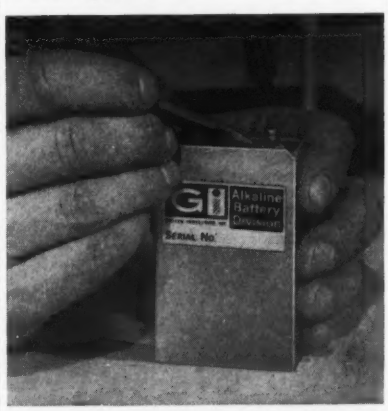
MORE

Titanium and Zirconium Used as Bonding Agents In Ceramic-to-Metal Seals

A ceramic-to-metal seal which forms a true molecular bond is one of the unique features of a new, rechargeable nickel-cadmium battery designed for outer-space service. It is reported that the technique developed to achieve this bond now makes possible the sealing of large ceramic inserts to flat metal surfaces.

A key to the process is said to be the use of a thin layer of bonding metals, such as titanium or zirconium, between ceramic and base metal. Fusing at 1,000°F. in a vacuum is reported to yield a complex alloy from the ceramic, base metal and bonding metals.

The technique is used in the new battery to join the iron-nickel contact terminals, the ceramic insulator and the body of the cell. The seal is claimed to be truly hermetic, giving high reliability and long life in outer space.



Pencil points to ceramic-to-metal hermetic seal on new, rechargeable nickel-cadmium battery designed for outer space service. (Photo courtesy Gulton Industries.)

Polyethylene Lab Being Built by U.S.I. Abroad

A new customer service laboratory is being constructed at Baar, Switzerland, by U.S.I.-International — known officially as Sales and Development Company of National Distillers and Chemical Corp. (International) S.A. Occupancy is scheduled for about July, 1961.

The new facility will support the efforts of U.S.I.'s European representatives for PETROTHENE® polyethylene resins. It is designed to help them give their customers the close technical assistance the polyethylene market demands.

The laboratory's processing and test equipment will be designed to meet European standards and operating conditions. It will demonstrate techniques for processing polyethylene, and will conduct research and evaluation studies to help improve products and develop new markets.

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★ U.S.I. CHEMICAL NEWS ★

CONTINUED ***Cesium***

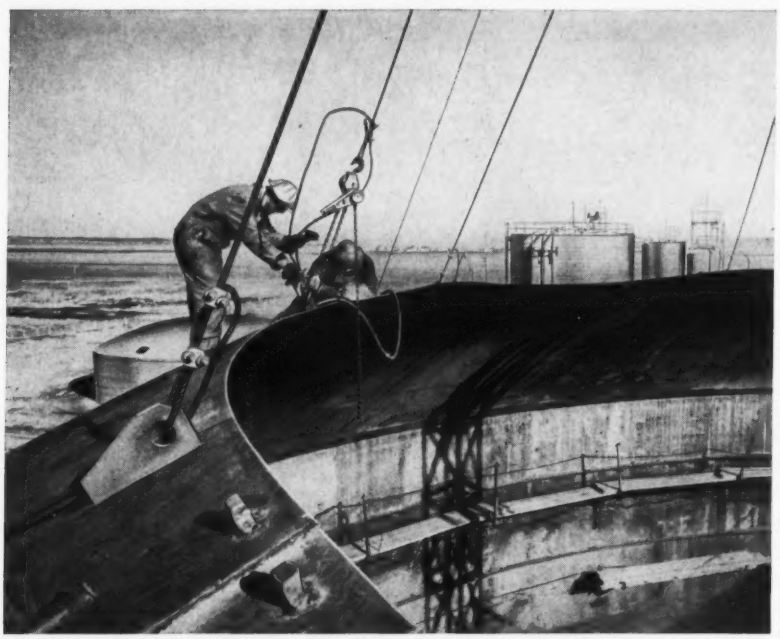
medium in power generators. Cesium also has potential in large catalytic processes since it can be recycled by sodium reduction of the recovered chloride.

The commercial availability of cesium is an outgrowth of U.S.I.'s research and development program on the use of sodium for metals production. This research has already resulted in the commercial availability of titanium and zirconium from U.S.I.'s affiliate, Reactive Metals Corporation.

CONTINUED ***Naphthalene***

treatment with 1.5% by weight of metallic sodium. Sulfur content can be reduced to under 0.05% at a cost of less than .5¢ per pound. Capital investment for a plant to treat 50-60 million pounds per year would be about $50,000.

For further information on this process, send for the new U.S.I. technical data bulletin "Desulfurization of Naphthalene by Sodium". Address Technical Literature Dept., U.S.I. Chemical News, 99 Park Ave., New York 16, N. Y.



Welders work on new, 7,000-ton ammonia storage tank, to be completed this month at U.S.I.'s Tuscola, Ill. plant. Tank uses relatively new technique of storing refrigerated ammonia at atmospheric pressure rather than storing it in pressurized tanks at moderate temperatures.

Shown under construction is inner tank, 88 feet in diameter and 56 feet high, which holds ammonia. This tank is surrounded by 2½ feet of insulation, and another steel tank which keeps moisture out of insulation. Ammonia is maintained at temperature of minus 28°F. by surface evaporation of ammonia itself. Evaporated ammonia is recompressed, condensed and recirculated to tank.

TECHNICAL DEVELOPMENTS

Information about manufacturers of these items may be obtained by writing U.S.I.

Heavy water can now be obtained on rental basis, for intervals from 3 months to 2 years. Cost depends on time used and amount of dilution resulting. Said to cost much less than purchasing or producing. . . **No 1680**

Seven special slide rules and calculators designed for chemists are described in literature now available. Help solve problems on radioactivity, structure of elements, chemical equations, pH, humidity, solutions, gases. **No. 1681**

Desulfurization of coke oven BTX by sodium is subject of new technical data bulletin now offered. Describes process, results and economies, tells when to use, gives costs. Includes tables and illustrations. **No. 1682**

Guide to translations of Soviet research in chemistry and metallurgy can now be obtained. Booklet describes 49 outstanding titles, including books, monographs, symposia, journals, and collections. Gives prices. **No. 1683**

New adhesive for multiwall polyethylene bags now on market. Used to spot-cement intermediate ply of polyethylene sheet, top and bottom, to adjacent layers of kraft. Said to form strong, positive bond. **No. 1684**

Circulating thermostats are now available which can be used for either heating or cooling, for control of liquid temperatures in a closed system, or for circulation of liquids to outside sources such as refractometers, viscosimeters. **No. 1685**

A new statistical technique for investigations involving a large number of variables—10, 20 and more—is described in literature now available. It is a non-mathematical method said to give fast and simple answers. **No. 1686**

Para-chlorothiophenol is now being marketed commercially. Material is suggested as intermediate for making oil additives, agricultural chemicals, plasticizers, rubber chemicals, dyes, wetting agents, stabilizers. **No. 1687**

New, revised edition of National Fire Codes can now be purchased. Incorporates important changes in many fire safety standards. Compiles 181 standards in 7 volumes. Includes 42 new or revised fire safety standards. **No. 1688**

New recording/controlling instrument employing fluorescence techniques is claimed to combine operating simplicity with high sensitivity and long-term stability. Provides signals for continuous recording or automatic controls. **No. 1689**

PRODUCTS OF U.S.I.

Heavy Chemicals: Metallic Sodium, Anhydrous Ammonia, Ammonium Nitrate, Nitric Acid, Nitrogen Fertilizer Solutions, Phosphatic Fertilizer Solution, Sulfuric Acid, Caustic Soda, Chlorine, Sodium Peroxide.

Organic Solvents and Intermediates: Normal Butyl Alcohol, Amyl Alcohol, Fusel Oil, Ethyl Acetate, Normal Butyl Acetate, Diethyl Carbonate, DIATOL®, Diethyl Oxalate, Ethyl Ether, Acetone, Acetoacetanilide, Acetoacet-Ortho-Chloranilide. Acetoacet-Ortho-Toluidide, Ethyl Acetoacetate, Ethyl Benzoylacetate, Ethyl Chloroformate, Ethylene, Ethyl Sodium Oxalacetate, Sodium Ethylate, Urethan U.S.P. (Ethyl Carbamate), Riboflavin U.S.P.

Pharmaceutical Products: DL-Methionine, N-Acetyl-DL-Methionine, Urethan USP, Intermediates.

Ethyl Alcohol: Pure and all denatured formulas; Anhydrous and Regular Proprietary Denatured Alcohol Solvents SOLOX®, FILMEX®, ANSOL®M, ANSOL PR

PETROTHENE® . . . Polyethylene Resins

MICROTHENE . . .Finely Divided Polyethylene Resin.

Animal Feed Products: DL-Methionine, MOREA® Premix (to authorized mixer-distributors).

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Division of National Distillers and Chemical Corporation
99 Park Avenue, New York 16, N. Y.

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Stereospecific reduction of steroid ketones to hydroxy derivatives

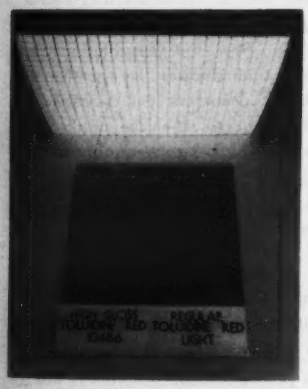
Complex hydride, lithium aluminum tri-t-butoxy hydride, should prove a useful agent for stereospecific reductions of steroid ketones to hydroxy derivatives. Available in laboratory quantities, the material will reduce acid chlorides to aldehydes. It can be easily handled in air and stored in screw-top containers.

(Lithium aluminum tri-t-butoxy hydride is a product of Metal Hydrides Incorporated, 12-24 Congress St., Beverly, Mass.)

Check 2874 opposite last page.

Higher gloss obtained with red pigment for paints

A distinctive yellow shade Toluidine red pigment for paints produces a higher gloss, more haze-resistant finish compared to a conventional Toluidine red pigment. Out-



door exposure tests have shown that the pigment maintains its higher gloss for more than nine months. Indications are that additional exposures, up to the limit of the durability of the film, will continue to show a noticeable improvement.

(Toluidine red light 10486 is a product of Pigment, Color & Chemical Division of the Sherwin-Williams Company, 260 Madison Ave., New York 16, New York.)

Check 2875 opposite last page.

BRIEFS

monochlorobenzene
tetrachlorophthalic anhydride
phosphorous acid

VERSATILE INTERMEDIATE

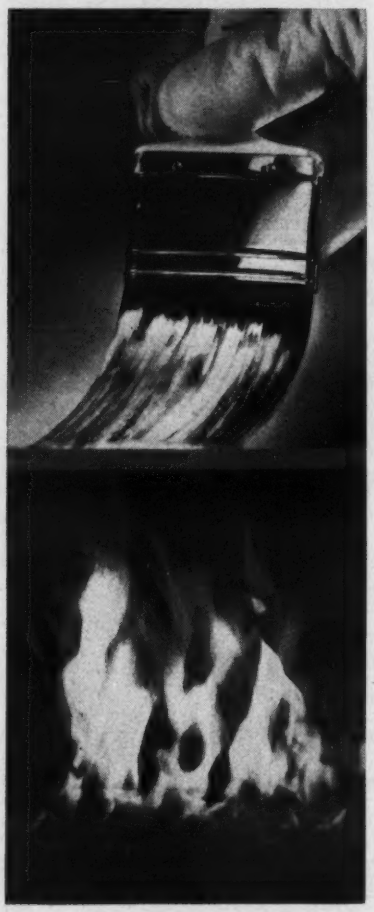
Hooker monochlorobenzene serves as an intermediate in preparation of insecticides such as DDT; in the manufacture of dyestuffs such as sulfur black and brown dyes; in the manufacture of organic synthetics such as picric acid, phenol, drugs and perfumes. It is a good heat-transfer fluid, too . . . especially for condensing-vapor systems where steam pressures would be impracticable. Monochlorobenzene is widely used as a general solvent and as a paint and varnish remover. We offer it as a clear, colorless liquid sufficiently free from materials less volatile than itself so that, after drying, it will distill within 1° C. Check the coupon for data sheet.

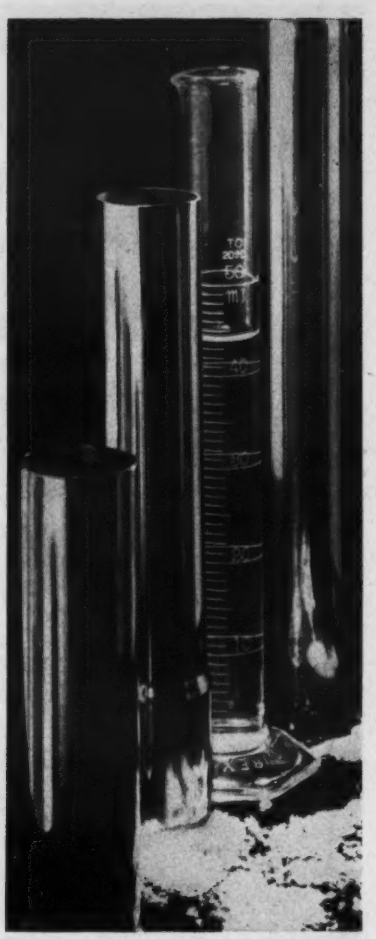
HOT STUFF AND COOL CHLORINE

If you are interested in imparting heat and fire resistance to alkyds, polyesters, plasticizers or similar products, tetrachlorophthalic anhydride may be just the intermediate for you to try.

It is sold under the trade name, Niagathal®, and carries half its weight in very stable chlorine. It has a melting point of 254°-255° C and its boiling point is more than 100 degrees higher. It has been possible to add as much as 22% by weight stable chlorine to polyesters using Niagathal.

You are welcome to a selection of technical papers on the many reactions and uses of this product. See the coupon.





NEED A THIN FILM OF COBALT?

In case you need a thin metallic film of exceptional hardness, or one that takes a brilliant polish, try electrodeposition of a cobalt-nickel layer, using Hooker phosphorous acid in the plating bath. We make H_3PO_3 in two forms: an aqueous solution containing 70-72% of the acid by weight or as a flake material assaying 97% min. H_3PO_3. Other uses of this strong dibasic: catalyst in organic reactions such as cross-polymerization of olefins and alkylation of aromatic compounds. Check the coupon for a copy of Data Sheet 792.

For more information, check here and mail with name, title and company address:

- ☐ Bulletins 46 and 47, Niagathal
- ☐ Data Sheet 788, Niagathal
- ☐ Data Sheet 703-D, Monochlorobenzene
- ☐ Data Sheet 792, Phosphorous Acid

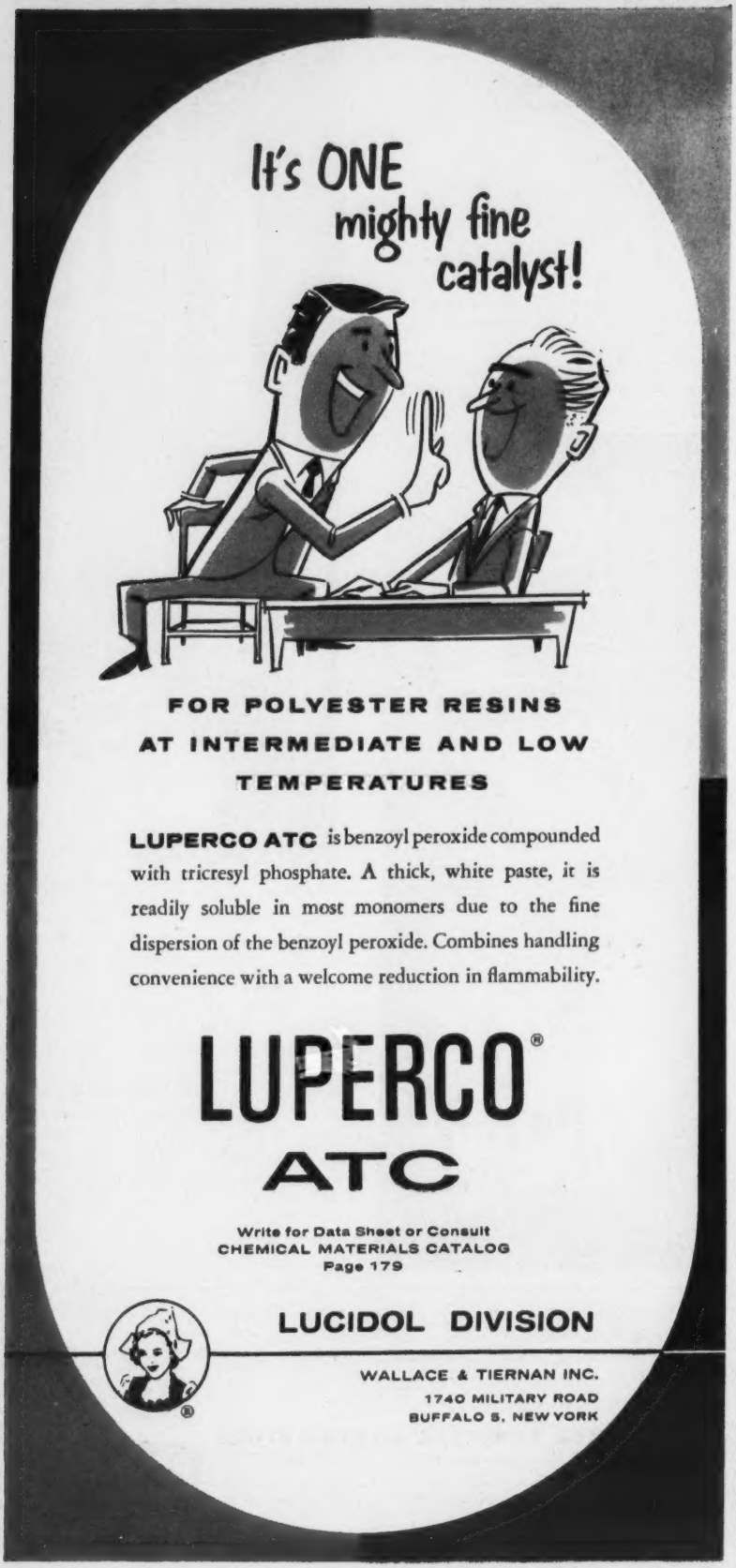
HOOKER CHEMICAL CORPORATION
503 Forty-seventh Street, Niagara Falls, New York

Sales Offices: Buffalo Chicago Detroit Los Angeles New York Niagara Falls Philadelphia Tacoma Worcester, Mass.
In Canada: Hooker Chemicals Limited, North Vancouver, B. C.

HOOKER CHEMICALS PLASTICS

Check 2876 opposite last page.

For more information on product at left, specify 2872 opposite last page.


It's ONE mighty fine catalyst!
FOR POLYESTER RESINS AT INTERMEDIATE AND LOW TEMPERATURES
LUPERCO ATC is benzoyl peroxide compounded with tricresyl phosphate. A thick, white paste, it is readily soluble in most monomers due to the fine dispersion of the benzoyl peroxide. Combines handling convenience with a welcome reduction in flammability.
LUPERCO®
ATC
Write for Data Sheet or Consult CHEMICAL MATERIALS CATALOG Page 179
LUCIDOL DIVISION
WALLACE & TIERNAN INC.
1740 MILITARY ROAD
BUFFALO 5, NEW YORK

Check 2877 opposite last page.

CHEMICAL MATERIALS

Fabric flammability cut by impregnant: butyltitanate

Uses: Polymer can be used to manufacture anti-corrosive, high-temperature varnishes; preparation of waterproof and non-flammable fabrics; as an aid in coating paper with plastic films or metal foils.

Features: Polymer can be used for impregnation of rubber fabrics against flammability.

Description: Yellow viscous liquid is condensation product of the tetrabutylester of orthotitanic acid. Titanium dioxide content is 35-38%. Material is insoluble in water, methanol, acetone and acetic acid. It is soluble in xylene, benzene, toluene, carbon tetrachloride and butanol.

(Polymeric butyltitanate is a product of Henley & Co., Inc., 202 E. 44th St., N.Y. 17, N.Y.)

Check 2878 opposite last page.

For more information on developments reported in this section, check corresponding numbers on Reader Service Slip opposite last page of this issue.

Pure metal powders made by atomization

Pure metal or alloy powders are now being produced in controlled size and shape. Produced by atomization, these high purity powders can be used in brazing alloys, filters, fuel cells and many other powder metallurgy applications.

Some of the powders available are those of stainless steel, silver and copper. Also available are aluminum-copper-nickel alloys; cobalt-chromium as well as other cobalt alloys.

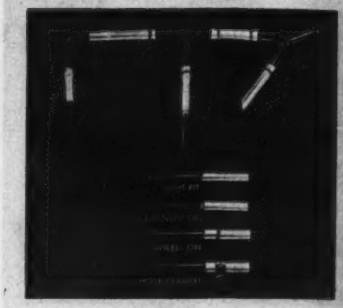
(Metal powders are supplied by Federal-Mogul Division Research and Development, Federal-Mogul-Bower Bearings, Inc., P.O. Box 1048, Ann Arbor, Michigan.)

Check 2879 opposite last page.

Your Best Source of Supply for TUBING CONNECTORS made from

TEFLON*

is PENNSYLVANIA FLUOROCARBON



PF TUBING CONNECTORS are available for laboratory, glassware and equipment applications in sizes to fit 3 mm through 12 mm glass tubing and in standard lengths of 1¾" with special lengths on request. They save considerable time when connections are to be made and permit misalignment of tubing without restricting flow, are reusable, easy to clean and sterilize. Inexpensive PF tubing connectors are particularly advantageous when the application involves high temperatures, strong solvents or corrosive fluids. They can be attached by wire, cement, hose clamp or tight fit.

PF Tubing connectors are stiff enough for use in vacuum systems without collapsing.

Write, wire or call for a quotation on your requirements. Other PF products made from Teflon include: instrument tubing from .010" I.D. through 1" I.D.; flexible tubing from ⅛" I.D. to 1⅛" I.D.; spaghetti tubing from AWG 0 to AWG No. 32; extruded shapes to customer requirements; rod and heavy walled tubing in standard commercial sizes.

PENNSYLVANIA FLUOROCARBON CO., INC.
1115 N. 38th Street, Phila. 4, Pa.
EVergreen 6-0603 TWX: PH 252
*DuPont registered trademark

Check 2880 opposite last page.

No volatile diluents in 100% reactive liquid epoxy

Uses: Resin has been specifically engineered for electrical and coating uses.

Features: Epoxy has a viscosity below 1000 cps and a boiling point over 150°C at 5 mm Hg absolute pressure. It does not contain volatile diluents.

Description: Low-viscosity, 100% reactive liquid epoxy resin, designated Epotuf ED-1025, can be cast under high vacuum without developing any foam-out due to diluent boil-off. Product is practically odorless making it easier to work with on large open laminates or on flooring, topping, or surfacing applications.

(Epotuf ED-1025 epoxy is a product of Reichhold Chemicals, Inc., White Plains, N.Y.)

Check 2881 opposite last page.

NEW LITERATURE
Chemical Materials

Facts on fluorosilicone rubber are presented in four-page brochure which discusses solvent resistance and other basic properties. Graphs show performance of Silastic LS during oven agings and ASTM oil exposure tests. Bul 9-113 — Dow Corning Corporation.

Check 2882 opposite last page.

Chemicals for leather industry are described in 16-page fact-filled brochure which discusses methods of using sodium sulfhydrate and sodium sulfide. Processing and quality advantages provided by these chemicals are summarized and recommended procedures outlined. Charts, table, drawings and pictures supplement the text. Bul 510 — Hooker Chemical Corporation.

Check 2883 opposite last page.

Properties and uses of ethers and glycol diethers are comprehensively presented in 40-page booklet. Physical properties, solubilities, storage handling and shipping, and selected literature references are included. Bul F-40524 — Union Carbide Chemicals Company, Div. of Union Carbide Corporation.

Check 2884 opposite last page.

PEABODY PRODUCES

—the whole world uses!

There are many Peabody quality products in "orbit" now and others will be introduced soon. Write to us, or to our representative in your part of the world, for descriptive literature.

PEABODY ENGINEERING CORPORATION
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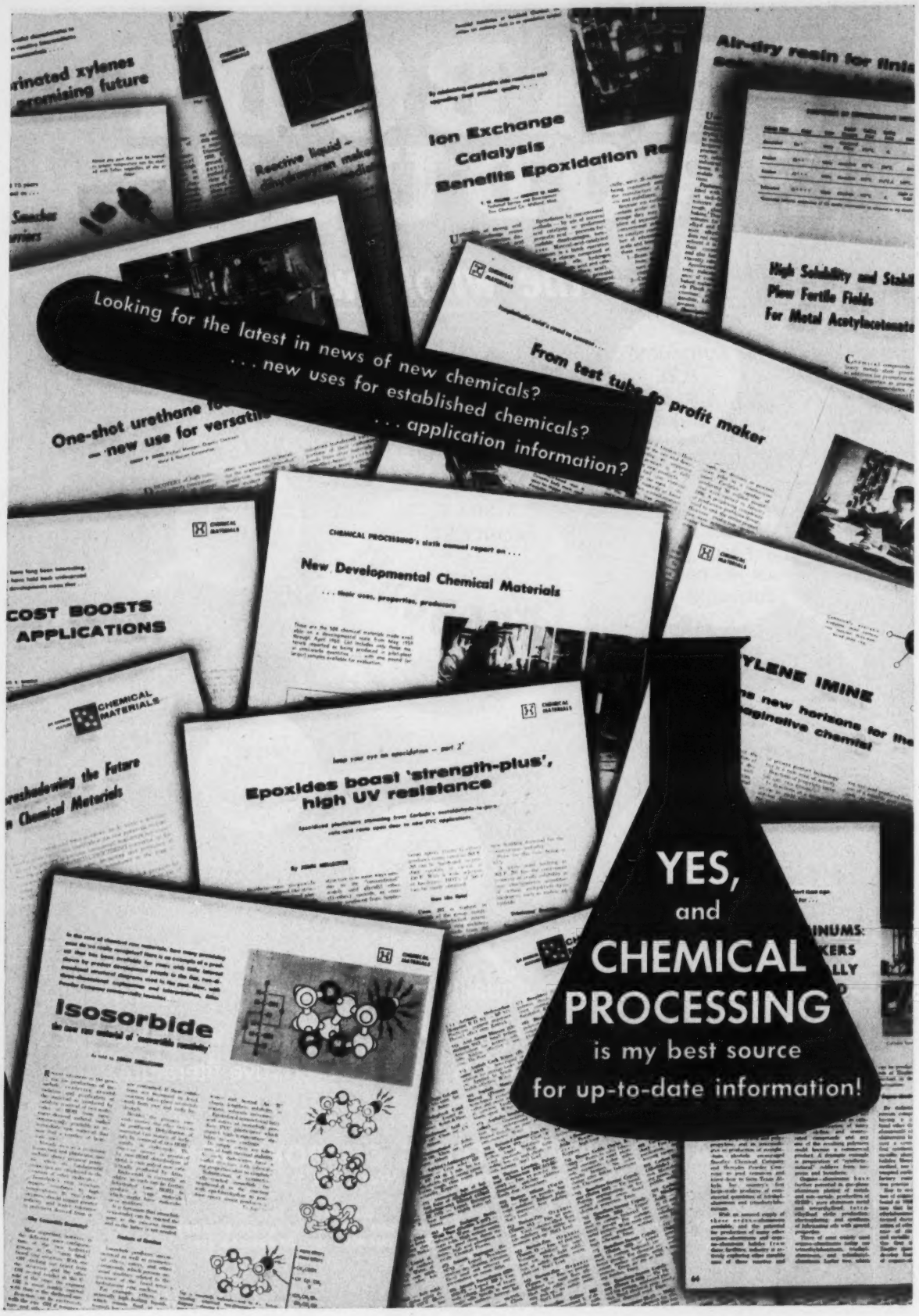

CHEMICAL MATERIALS

General-purpose resins, latexes and other compounds are described in 20-page booklet. Resin classes include polyvinyl chloride, acrylonitrile-butadiene-styrene and polyurethane. "Quality Plastics for Quality Products" — B. F. Goodrich Chemical Company.

Check 2886 opposite last page.

Resistance of polysulfide rubber to halogenated hydrocarbons is pointed up in brochure of eight pages. Resistance of polysulfide rubber is compared with other rubber types for various fluids. Bul PS-1 — Thiokol Chemical Corporation.

Check 2887 opposite last page.

Fire retardant-intumescent coatings are detailed in bulletin of four pages which discusses physical characteristics, flame spread rates, and recommended formulations — National Starch and Chemical Corporation.

Check 2888 opposite last page.

Acrylic emulsions used as paper modifiers receive attention in 20-page booklet. Ample graphic and tabular data simplify selection of proper resin or blend of resins to achieve desired balance of physical properties in finished product. Details are presented on characteristics of emulsions and techniques of incorporating them into paper. "Rhoplex Acrylic Emulsions for Paper" — Rohm & Haas Company.

Check 2889 opposite last page.

Thixotropic action of Thixcin E in polyester resins is discussed in three-page application newsletter. Charts comparing effect of various additives on polyester viscosity are included. Application newsletter 60 — The Baker Castor Oil Co.

Check 2890 opposite last page.

Epoxy adhesives are outlined in technical data bulletin that outlines physical characteristics and suggested applications. "Isochem-bonds Bulletin" — Isochem Resins Company.

Check 2891 opposite last page.

A stabilized stannous octoate catalyst for urethane foams is detailed, together with test data comparing performance with other catalysts in the Bul F-4P — Witco Chemical Company, Inc.

Check 2892 opposite last page.

Two polystyrene bulletins cover general-purpose, high-heat (171-140A) and high-impact (171-138A) materials — The Dow Chemical Company.

Check 2893 opposite last page.

THAT'S INTERESTING

Tailor-made plant food

A magnesium ammonium phosphate fertilizer that will not burn or injure roots or foliage has been developed by W.R. Grace & Co.'s Research Division.

Composed of 8% nitrogen, 40% phosphate and 24% magnesium oxide, fertilizer can be tailor-made to meet needs of customer.

Compound makes essential plant nutrients slowly available over an entire growing season.

Solar cells 'goggled'

The 9260 solar cells used on the weather satellite Tiros II were optically treated to rebuff the sun's heat rays which impede the photovoltaic conversion of sunlight into electrical energy.

This treatment has the same effect as putting sun glasses on the solar cells.

For more information on product at right, specify 2894 see information request blank opposite last page.

When MRS. CONSUMER is offered a

BETTER PRODUCT!

She switches to the better product.

Proof of this is how detergents have largely replaced soaps within a ten year period.

But to offer the consumer a better product you must often begin with a better raw material, as in this case.

Oronite pioneered and became the leading supplier of detergent raw materials with its product ALKANE.*

Oronite markets many remarkable chemical raw materials... which have changed consumer buying habits. Possibly an Oronite material could make a better product for you? Ask us.

*T.M. Detergent Intermediate

Where chemical raw materials are born and produced in volume

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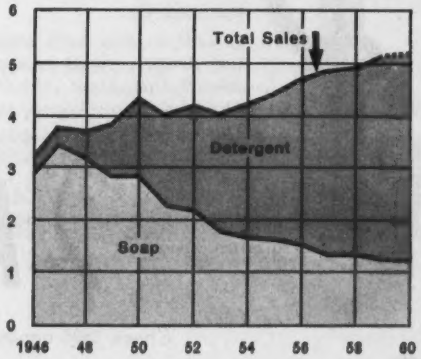
FOREIGN AFFILIATE • California Chemical International, Inc., San Francisco, Geneva, Panama, Sao Paulo

6951

Total Soap and Detergent Sales, 1946-1960
Billions of Pounds (as sold basis)



Gunpowder mixing unit consists of two opposed-type screw agitators housed in a one-inch-thick tally bowl shown here. Top portion of the bowl and agitator troughs are fabricated of Ampco metal plate; bottom ends are sand-cast Ampco metal.

Practically no wear in 1½ years of mixing explosives!

AMPCO®

Mixer is made of strong, tough AMPCO metal to resist abrasion

One of two screw agitators cast of Ampco metal and then machined.

The highly abrasive effect of dynamite wears most metals mirror-smooth in a hurry. Yet, in one powder plant—after 1½ years' service — components of this mixing bowl still show the original grinding marks made during fabrication!

The mixer is all Ampco metal, a high-strength copper-base alloy — even to the weldments. Sand castings and plate of Ampco metal are welded together with Ampco-Trode weldrod of similar physical and chemical characteristics.

Resistance to abrasion — and to erosion and corrosion — is just part of the story. Because Ampco metal is also spark-resistant, the hazards of explosives mixing are minimized.

Call in the field engineer and discuss ways *you* can use Ampco metal profitably. Or write for details. *Ampco Metal, Inc., Dept. 191-C, Milwaukee 46, Wis. West Coast Division: Huntington Park, Calif. — Southwest Division: Garland (Dallas County), Texas.*

AMPCO®

TS-8C

Check 2895 opposite last page.

Polycarbonates Pioneer

From page 30

on its own. The operation was highly decentralized, and operating as an integrated unit, efficient operation was a necessity. Although a part of the corporation, the project was set up to stand on its own feet and thus had to be extremely cost sensitive and profit conscious. Product, process and market development were all part of the operation at that time.

After sufficient product study and market investigation a broad sales-development program was started in 1957. The pilot-plant facility at Pittsfield had expanded to a level which would make available pounds of material for evaluation, but not thousands of pounds.

It was at this point that R. J. Thompson, who had been working for the parent organization in Alkyd Sales, joined the Lexan group. Later, in June 1960, he became manager of Lexan market development.

A short time earlier the need for technical service was recognized. E. F. Fiedler, affectionately called "Dutch," brought his broad knowledge of the plastics field to the group. Dutch worked in the field to acquaint the molder with the handling characteristics of Lexan.

The molder was familiar with the peculiarities of handling nylon. It was now necessary to help him build up similar knowledge about Lexan. This too, was a critical stage in the developmental program and one that needed the guidance of a man who had a strong background in all phases of thermoplastics.

Operations Expanded

While piloting from 1957 to 1959, the men who were to later take over commercial production continued to improve and enlarge this operation. Also, during this period, operations had been enlarged to a semi-works stage, where capacity rose to hundreds of thousands of pounds of material per year. This provided sufficient capacity for the continuation of the sales-development program.

It was now recognized that a full commercial plant was in order. Decision was made in 1958 to build such a plant on a 162-acre tract along the Ohio River near Mount Vernon, Indiana.

Project Goes Commercial

First full-scale production started in October 1960. Plant represents an investment of 11 million dollars for research, development and production facilities to produce five million pounds per year of the product.

The experience gained by George E. McCullough, manager of Lexan manufacturing, Robert L. Hatch, manager, shop operations, and Robert G. Worman, manager of manufacturing engineering, in pilot-plant operations was most valuable. The operation moved from the pilot plant to commercial stages with the least amount of "headaches". Giving the production team this pilot-plant background undoubtedly speeded and eased the move to the commercial stage.

Furthermore, the production

YOUR OPINIONS —

— and comments on the significant subjects carried in each month's CHEMICAL PROCESSING are important! We welcome your letters expressing your views. Many CP readers are taking the opportunity to state their views on today's top questions.
By publishing your letters in CHEMICAL PROCESSING others will have the opportunity to hear your side.

Perhaps you agree

With what has been written in these articles.

Maybe you don't.

You might even have a thought or angle which wasn't expressed. If so, why not let us and others hear your ideas? Suitable letters will be published in the regular "Letters from Readers" columns. Address your comments to: The Editor, CHEMICAL PROCESSING, 111 E. Delaware Place, Chicago 11, Illinois

team was responsible for the work of design, building and operation.

In January 1959, the Lexan project was transferred from the Chemical Development Department to the Chemical Materials Department, now under the guidance of Dr. A. E. Shubert, general manager.

The future looks promising for the polycarbonate field. General Electric estimates that the annual market potential by 1965 will be 30-50 million pounds and in ten years 75-100 million pounds.

Full credit goes to the coordinated team effort in carrying this product from the pilot plant to full-scale commercial production in three years. All along the way, research, product development, technical service, market development, engineering, operations and manufacturing cooperated to bring a major development to commercial fruition. ■

Process Dynamics

From page 33

The other approach — the "empirical" approach — is based upon the application of the appropriate formula, usually empirical in nature.

Each approach has its proper area of application. In areas where experience is lacking but where there is a reasonable picture available of the flow patterns and transport processes involved, the fundamental approach will at least give fairly decent answers. Any sort of empirical approach in all probability will not.

On the other hand, where simple procedures are available and are used in their tried range of validity, the less rigorous approach usually gives answers that are reasonably correct with a minimum of time and effort. The main problem is that of selection — of deciding whether or not the formula in the handbook applies in a given situation.

It has already been mentioned that many chemical engineering design methods require a considerable amount of computation. Even the con-

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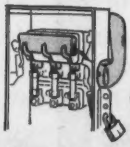
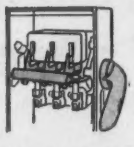


WHEN IT'S UP IT'S ON!



WHEN IT'S DOWN IT'S OFF!

Handle is integral part of switch, not cover. When door is opened, handle remains attached to switch. Eliminates hazard of false handle indication or defeat of padlock provision. When it's padlocked, it's locked!

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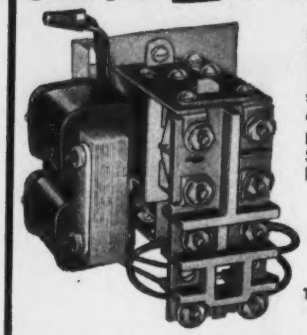

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Designers and manufacturers of pulverizing, classifying and separating equipment for industry.

Check 2899 opposite last page.

Process Dynamics

From preceding page

ventional methods, when used over and over again, consume considerable amounts of time in calculation.

Fundamental Approach More Demanding

The more fundamental approach to chemical engineering leads to even more complex computational tasks if one wishes answers. Fortunately, the development of high-speed electronic computers, both analog and digital, in the last few years has greatly alleviated the computational burden placed upon the engineer.

However, the engineer must be prepared to make efficient use of such aid, particularly in working with dynamics. Computer time tends to be more expensive than one might like. Also, the amount of data which can be generated by indiscriminate use of such computers can be staggering. This alone is a convincing reason why many of the design methods of the past must be re-cast to achieve efficient use of computers.

Of course, the proper type of computer must be chosen for the problem in hand, a

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much better design (or analysis) resulting from the proper use of a computer.

In the past, only one or two cases would be computed. One designed for specifications and that was that. Now, one can explore variation in performance of a given design with respect to changes in one or more of the input variables. Then too, one can determine how sensitive the design is to small errors in the estimation of one or more critical perameters.

When such an approach is used, considerably more confidence can be placed in the validity of the design . . . . a factor of no small consequence when the very *basis* of design is undergoing change. ■

Synthetic Detergents

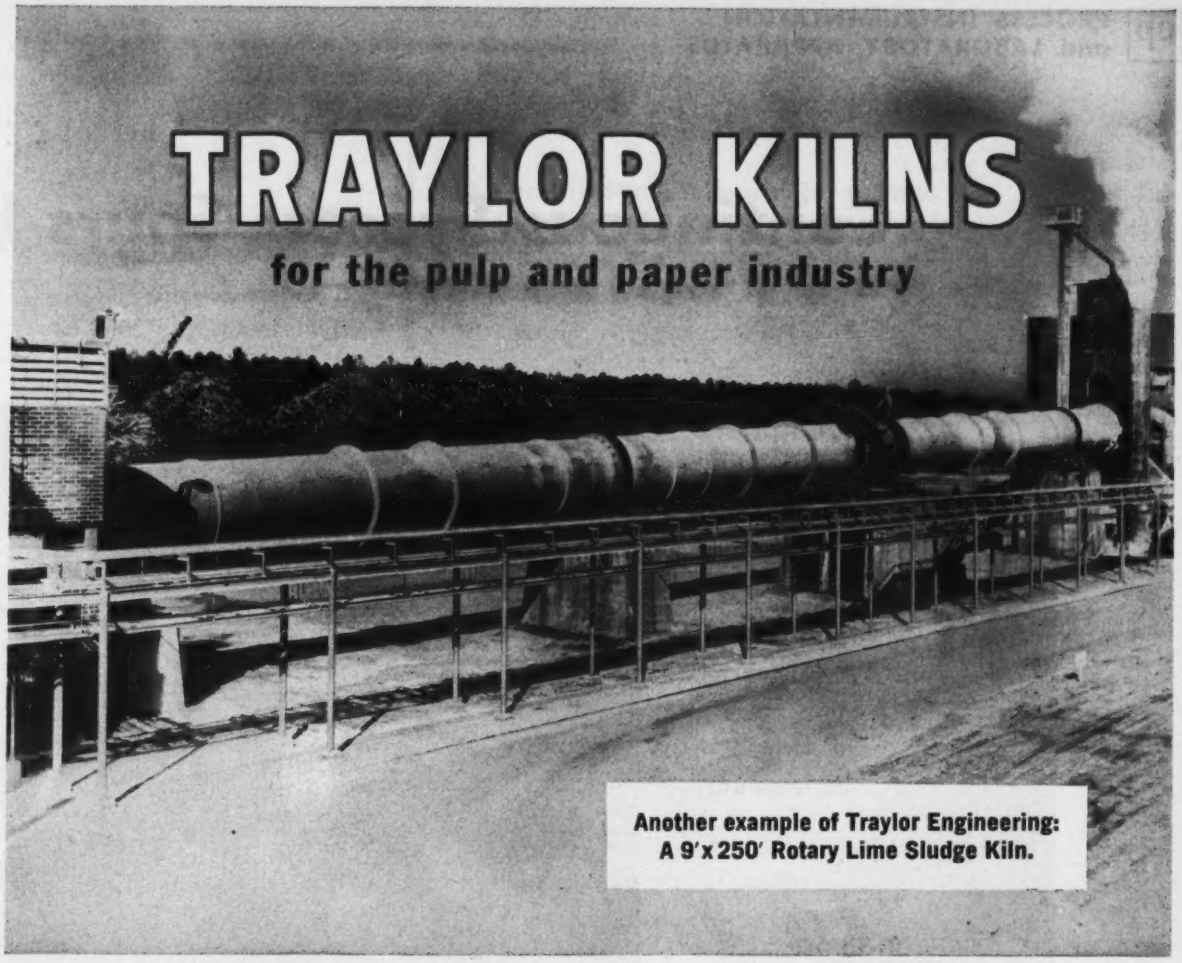
From page 27

in sewage treatment than the old. Tentative conclusion is that substitution of the new ABS for that generally in use would substantially diminish the troubles associated with synthetic detergents.

It has also been reported that the new ABS used in England was manufactured by Shell and originally sold at a price equivalent to the old ABS. Later the price of the newer material was increased to slightly more than that of the old. Each was equally effective in cleansing power. The new type ABS is reportedly not available in the U. S.

U.S. Companies Working On Soft Detergents

Whether this newer, more easily metabolized ABS is eventually made available and used in the U. S., or if other chemicals are developed for use in place of the present ABS, a concerted effort is being made by many U. S. companies to develop a soft detergent in some way. We plan to report in a future article on the progress being made in this area by companies manufacturing detergents as well as those making chemicals for use in detergents. ■



Another example of Traylor Engineering:
A 9'x250' Rotary Lime Sludge Kiln.

One of the most important advantages of Traylor Lime Sludge Kilns in pulp mill operations is their money-saving efficiency in recovering lime for reuse over and over again. This, plus Traylor's unexcelled heat recovery systems and thorough, experienced attention to engineering details, produces kiln installations that are notable for continuous service.

Write for Bulletin TKB-3 on Heat Recovery Systems, or Bulletin No. 1115 on Traylor Kiln installations.

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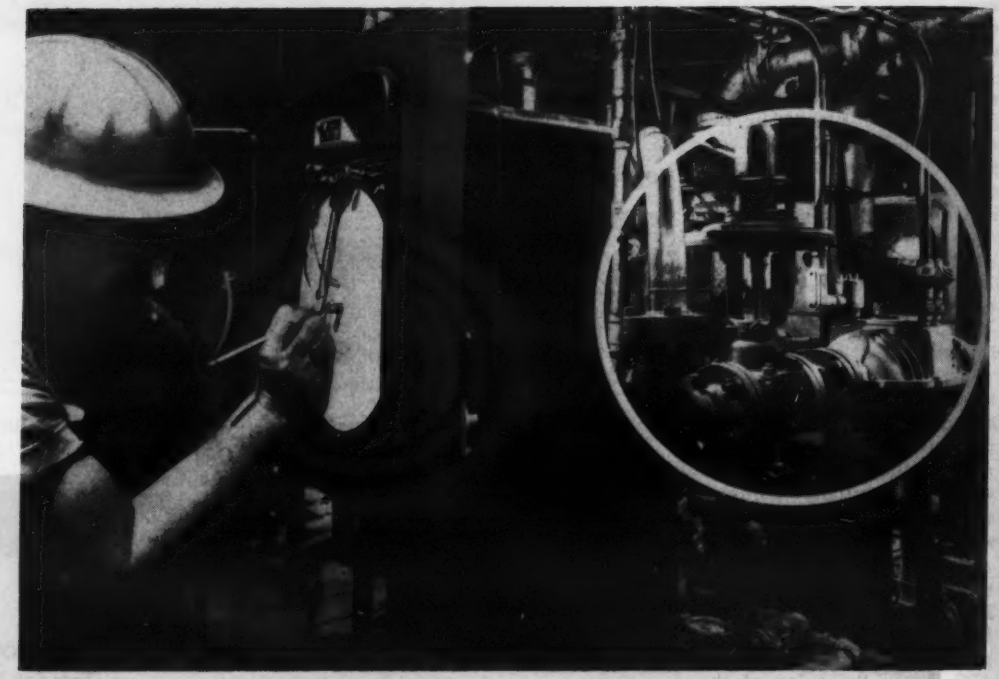
TKA-11

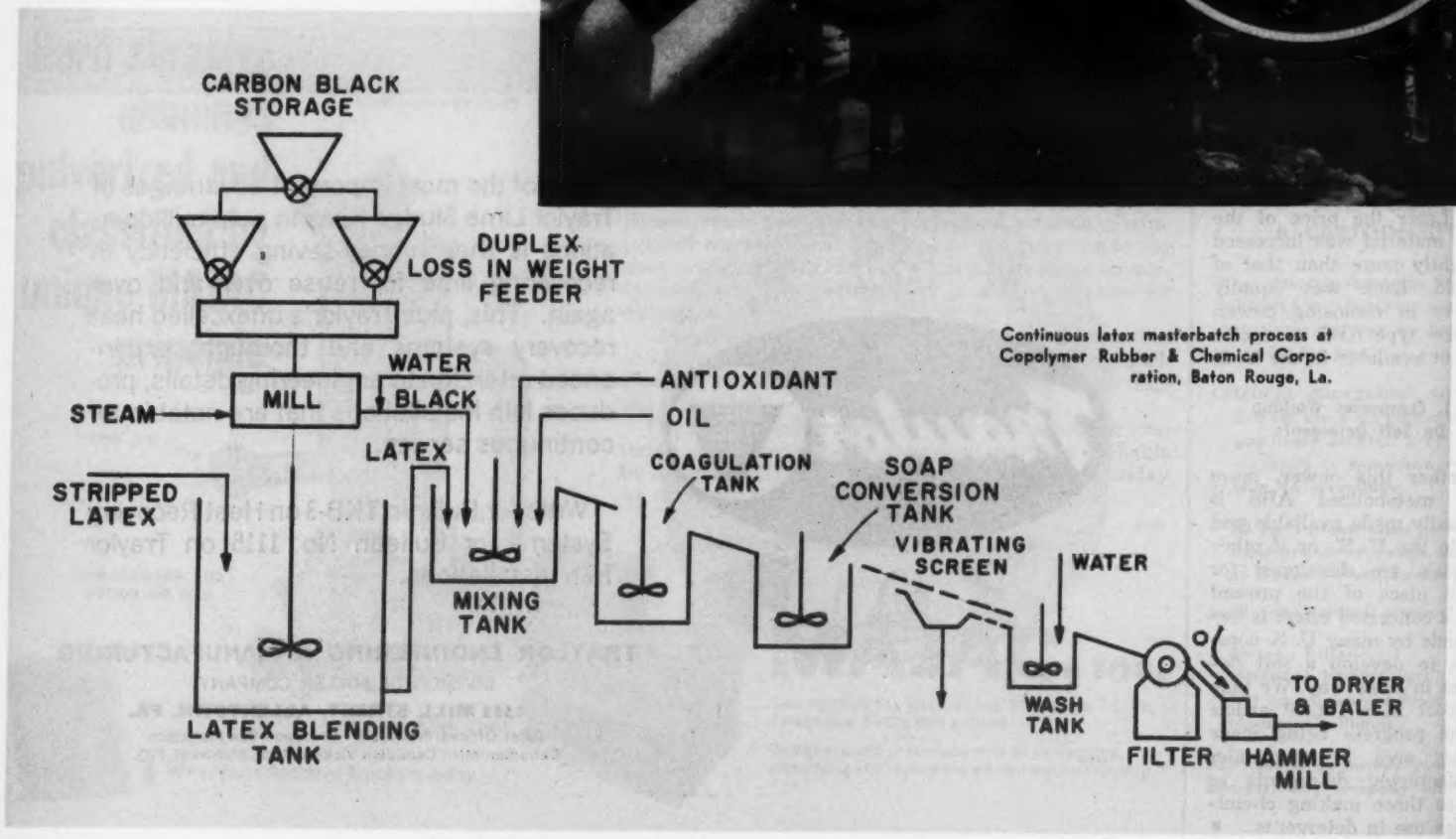
Check 2900 opposite last page.

Continuous Process Spurs Up-Surge

By **M. E. SAMUELS**
Development Manager
and **J. D. SUTHERLAND**
Assistant Development Manager
Copolymer Rubber
& Chemical Corporation
Baton Rouge, La.



Magnetic meter-controller (boxed) maintains uniform latex flow



Continuous latex masterbatch process at Copolymer Rubber & Chemical Corporation, Baton Rouge, La.

In Black Masterbatch

Automatic feed, flow and pH control help to make possible first continuous full-plant-scale production of non-dispersant-type black masterbatch

A NEW SOLUTIONS FEATURE

ALTHOUGH carbon black masterbatches have been on the market since 1944, their use prior to 1957 had only claimed a small percentage of the market. There were several reasons for the relatively small consumption of black masterbatch and also for the decline that occurred shortly before 1957.

Greatest deterrent to the use of black masterbatch was that it did not offer the desired quality in tire-tread stocks, which consumed the largest quantities of styrene rubber.

It was believed that this deficiency was due to the use of chemical dispersing agents. These dispersing agents attached themselves to the surface of the black particles, preventing adequate rubber-to-black bonding and thereby reducing the physical properties of the masterbatch. Development of a method for making black masterbatches without the use of chemical dispersing agents appeared to be the only answer. But a process to do this would have to be continuous with the introduction of the black dispersion into the latex and co-coagulation.

The major breakthrough occurred in the development of a non-dispersant black masterbatch process which consisted of grinding and dispersing carbon black in water with a fluid-energy pulverizer, without the use of a chemical dispersing agent.

With the advent of the continuous process it became known that superior tread wear would be obtained in tire tread stocks with black masterbatches. Early in 1958, Copolymer Rubber & Chemical Corporation installed the first continuous full-plant-scale production of a non-dispersant type black masterbatch. Commercial sale of CARBOMIX* started at that time.

Process Description

Arrangement shown in the process diagram indicates the major steps in the continuous operation. Stripped latex, carbon black, oil emulsion and antioxidant are accurately and continuously metered into a common stream and very carefully blended in a mixing tank. Continuous overflow from the mixing tank enters an open-top agitated coagulation tank containing a dilute sulfuric-acid solution at an automatically controlled low pH.

Since the coagulation process requires no salt, the final product has lower percentages of soluble material or ash than is found in some conventional masterbatches or in most butadiene-styrene polymers.

Mineral acid reacts with the soap to convert it back to its insoluble organic acid, thereby destroying its ability to hold the rubber in suspension. Rubber comes out of suspension in one-quarter-inch to one-inch crumb to overflow with the acid serum into a soap conversion tank. This tank provides additional residence time for a total conversion of the soap to organic

*CARBOMIX is a registered trademark of Copolymer Rubber & Chemical Corporation

Acid serum is separated from rubber crumb on vibrating screen

Automatic hydraulic baler ejects 7 x 14 x 28" bales — later automatically checked for metallic contaminants

acid and to blend the crumb.

Rubber crumb and acid serum overflow to a vibrating screen where the serum is taken off. Crumb is introduced into a reslurry or wash tank where it is thoroughly washed. Water and crumb overflow to a rotary drum vacuum filter. As much water as possible is immediately removed by the combined action of the vacuum within the drum and the wringer type squeeze rolls.

Filter cake is pulverized in the hammermill to the correct size. A squirrel cage blower provides air to convey the crumb into a three-pass apron type dryer.

Leaving the dryer the crumb is carried by screw conveyor and bucket elevator into a batching weigh scale. Here, 90 lb batches are accumulated and dropped into an automatic hydraulic baler which presses out 7 x 14 x 28″ bales. The product is continually checked by a moisture detector designed by Copolymer which passes only those bales having less than a specified low moisture content. This has special importance to the rubber processor because short mixing cycles utilizing black masterbatches often do not remove previously acceptable moisture levels. Bales are passed through a metal detector which automatically rejects any bale containing only a few grams of tramp metal.

Automatic Control of Four-component Mix

Continuous operation of this process is primarily dependent on accuracy of feed rates and proportions of the four-component mix. Primary control is based upon the metered flow of dry carbon black pellets to the fluid-energy pulverizer. Flow of latex, oil emulsion and antioxidant are controlled automatically in relation to this primary flow.

Currently, Copolymer is producing more than a dozen different formulations of CARBOMIX wherein proportions of the components are

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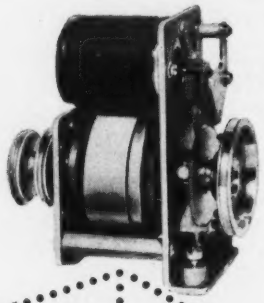
You economize with servo power because you no longer need conventional "black boxes" for auxiliary functions. You save on panel space . . . and installed cost.

Optional features made possible by servo power include integral process alarms, retransmitting potentiometers, function generation and digital output with encoder discs. Ask your Taylor Field Engineer to demonstrate the built-in plus value of servo power in the TRANSCOPE line. Or write for **Bulletin 98286** (Pneumatic) or **98335** (Electronic). Taylor Instrument Companies, Rochester, New York, or Toronto, Ontario.



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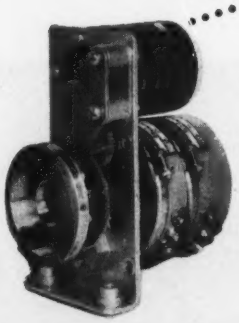
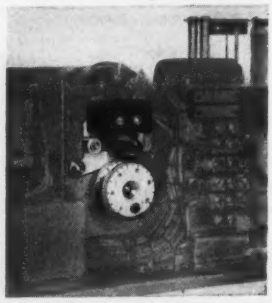
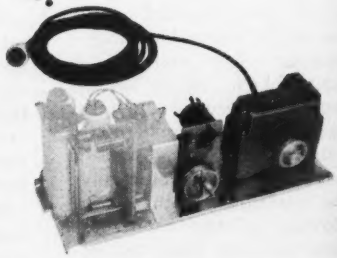
Precision gearing couples servo to a precise feed-back device with high torque. Built to military specifications.



RETRANSMITTING POTENTIOMETER
permits numerous computations such as $xy, \frac{x}{y}, \frac{xy}{z}, \sqrt{x}$.



INTEGRAL ALARMS
cost approximately 1/3 as much as conventional external "black boxes".



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Taylor Instruments

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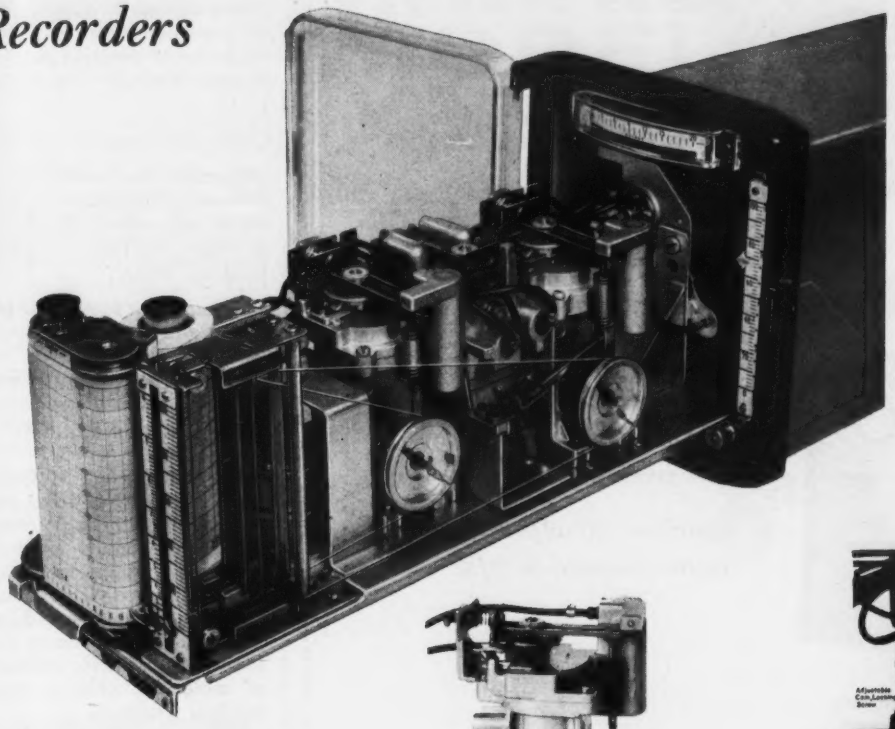
Recorders



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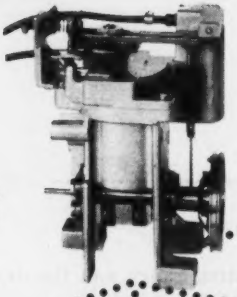

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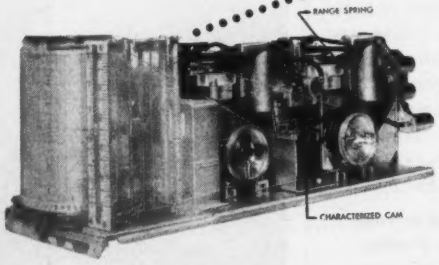
Alarm points convenient to set on calibrated dials.



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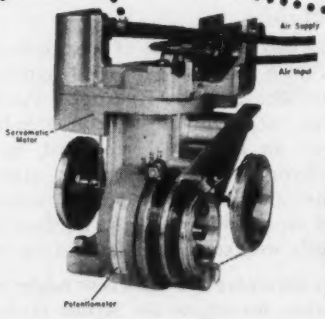
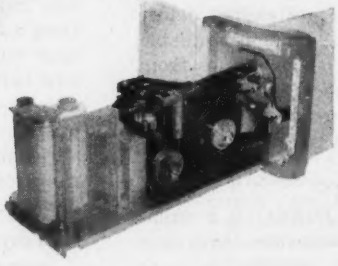
puts square root extraction and other similar functions within recorder.



POTENTIOMETER
costs about half as much as usual "black box" transducers.



DIGITAL ENCODER
sets new standards of accuracy for pneumatically driven encoders.

MEAN ACCURACY FIRST

Check 2901 opposite last page.

varied to provide these combinations.

Carbon black is fed from the supply hopper to the duplex feeding system. Two loss-in-weight feeders are employed in a completely closed-loop control system. Each has a single weigh hopper.

The two hoppers are scale-mounted, each balanced against its own scale beam and traveling poise. Both poises are moved along their scale, at equal speeds in opposite directions, by two lead screws driven from a common drive and reversing mechanism. Deviation of either scale beam from null-balance causes its controller to send an appropriate signal to feed or fill mechanism.

One hopper is alternately filling while the other feeds — at identical rates. Reversal of lead-screw rotation and transfer of controls is automatic and practically instantaneous.

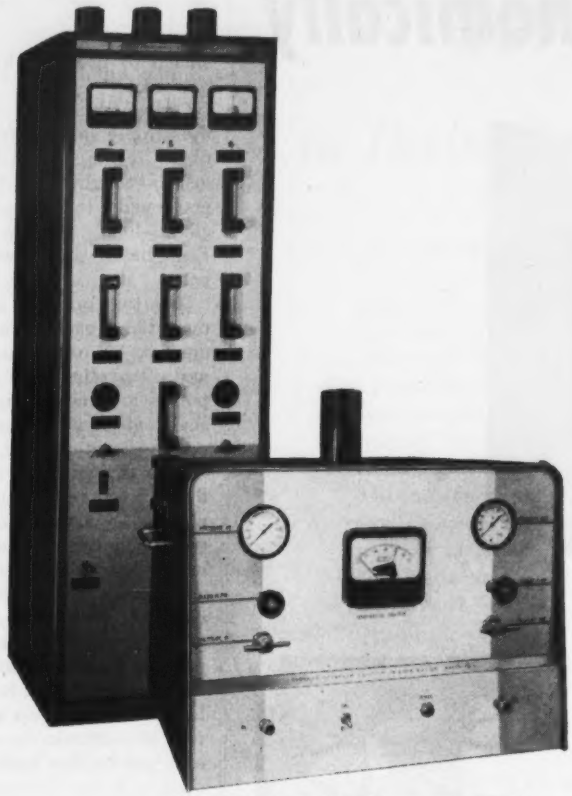
Latex Flow

A magnetic flow transmitter is installed directly in the latex line. This sends an electric signal proportional to flow rate to the flow-recorder-controller to maintain latex flow at the pre-determined quantity.

Process liquid flows straight through the transmitter without loss of head. Instrument provides an accurate measurement of flow since it responds to liquid velocity only and is not affected by variations in density, viscosity or line pressure.

Oil and Anti-oxidant Flow

These component flows are measured by means of orifices. For each component the differential pressure developed by the orifice plate is directed to a differential-pressure-cell transmitter. This in turn develops a pneumatic impulse proportional to flow, which is transmitted to the flow recorder-controller which operates a diaphragm control valve to maintain a pre-es-



Serfass Hydrogen Purifiers—15 cfh unit foreground, 200 cfh unit background.

NEW

HYDROGEN PURIFIER

separates dry, ultra-pure hydrogen from impure sources

capacities: 40 ml/min to several thousand cu ft/hr

The Serfass* Hydrogen Purifier now makes it possible to produce dry, ultra-pure hydrogen from impure gas sources. By using a palladium-silver alloy to separate all impurities, this equipment produces hydrogen so pure that modern analytical techniques cannot detect impurities. The Serfass Hydrogen Purifier is available in a wide range of models. Units with capacities from 40 ml/min to 200 cfh are standard. Larger purifiers can be designed to meet customer needs up to several thousand cubic feet per hour.

Palladium-silver alloy the answer

Nucleus of the Serfass Hydrogen Purifier is a palladium-silver alloy that selectively separates hydrogen from all impurities. The alloy is superior to pure palladium because it has a greater diffusion rate and does not deteriorate after repeated heating and cooling cycles as does pure palladium. No purging or external vacuum system is needed.

Operation simple, positive

To operate, the equipment is plugged into any convenient 115-volt a-c outlet, the impure hydrogen connected to the inlet, pressure and gas flow adjusted to the proper operating range and the dry ultra-pure hydrogen collected at the outlet.

Applicability

Any non-corrosive source of hydrogen essentially free from sulfides and non-saturated hydrocarbons can be used with the Serfass Hydrogen Purifier. Units are now being used for gas chromatography, flame photometry, as an analytical standard, hydrogen atmospheres, hydrogenation reactions, atomic energy applications and missile propellant research. The wide range of capacities makes the Serfass Hydrogen Purifier equally well suited for laboratory or industry.

If dry, ultra-pure hydrogen is or might be used in your operation, investigate the Serfass Hydrogen Purifier. It may be THE ANSWER to a problem or the route to greater economy in producing pure hydrogen.

Write for Bulletin #1159-1
Milton Roy Company, 1300 E. Mermaid Lane, Phila. 18, Pa.

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CHEMICAL-INSTRUMENTATION SYSTEMS

Controlled Volume Pumps
Quantichem Analyzers
Chemical Feed Systems
pH Instruments

*Dr. Earl J. Serfass, V.P., Research & Development at Milton Roy, developed this apparatus.

Check 2902 opposite last page.

tablished flow through the system.

(Loss-in-weight duplex feeder is a product of B-I-F Industries Incorporated, 345 Harris Avenue, Providence, R. I.)

Check 2903 opposite last page.

(Magnetic flow controller and differential-pressure pneumatic transmitter are products of the Foxboro Company, Foxboro, Mass.)

Check 2904 opposite last page.

▸ A NEW SOLUTIONS ARTICLE

IR aids in study of outdoor paint

The Goodyear Tire & Rubber Company has developed a method of studying chemical changes in paints and other exterior coatings during outdoor exposure. This permits compounding of more durable paint materials because it allows more accurate evaluation of molecular changes during outdoor exposure.

It has been known for some time that structural changes in the molecules of organic paint or coating vehicles could be studied by depositing clear coatings on salt blocks and recording infrared spectrum before and after exposure to heat or sunlamp. These changes can be assigned their actual significance.

A Goodyear-developed method of studying chemical changes in paints and other outdoor coatings during exposure permits compounding of more durable paint materials

The new method, which Goodyear has developed, consists of depositing one or more

thin (1.0 mil) coatings on lighting grade-polished aluminum panels or on tin-plated panels. The infrared spectrum of the coating is recorded by reflectance from aluminum or tin surface.

Panels have been exposed to actual weather exposure and subsequent spectra obtained by reflectance after various intervals of aging. Changes in spectra at significant points such as 3400 cm^{-1} for OH formation and 1725 cm^{-1} for COOH formation are measured. Increase in absorbance is plotted versus time. Slope of curve obtained is measure of rate of degradation of coating material. Goodyear is in process of collecting data on various coating materials using this method and plans to publish the results when exposure data are complete.

(Infrared spectrophotometer 21 is product of Perkin-Elmer Corporation, Norwalk, Conn.)

Check 2905 opposite last page.

Quick chart switch

. . . is purpose of automatic chart changer for circular-chart recorders. Changer makes it possible for recorder to operate unattended for as many as 16 days, using 24-hr charts.

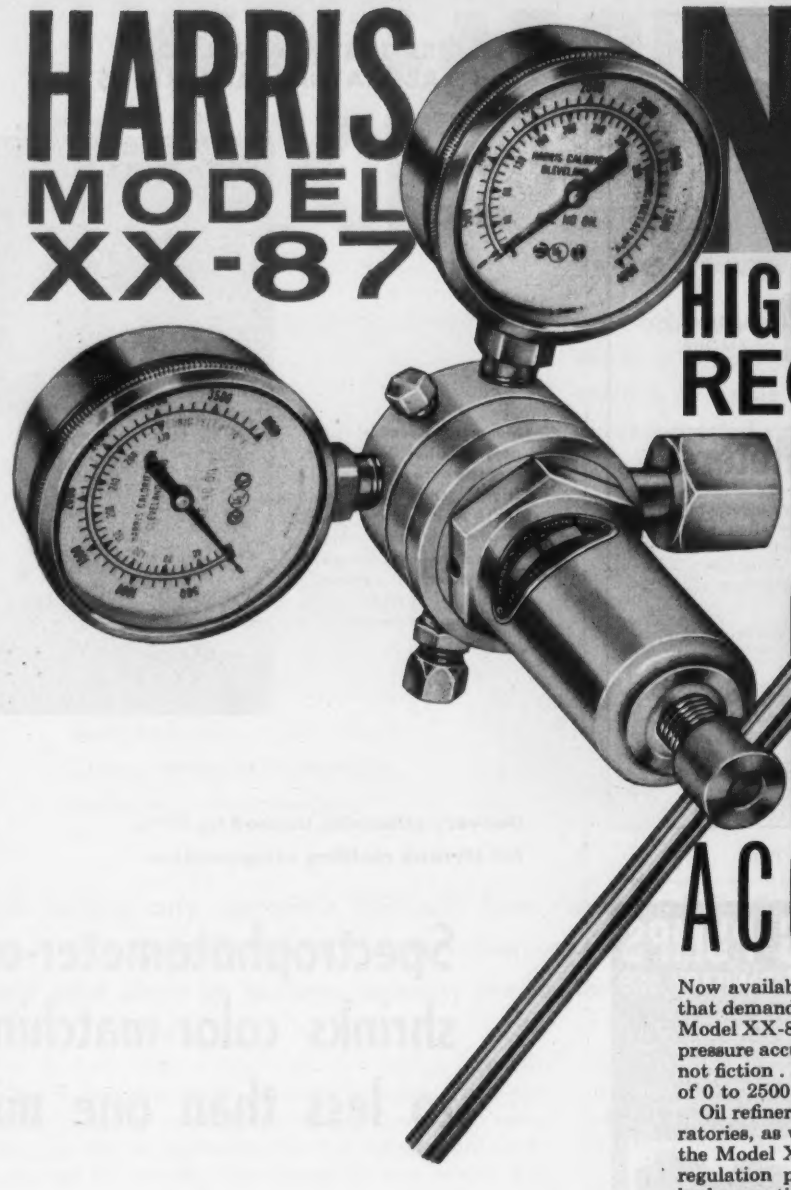
Chart changer consists of chart plate which holds charts, and chart scroll which moves used chart out of way of succeeding one without interrupting recording sequence. After charts are recorded upon, they are held within recorder case until they are taken out and new charts installed. Entire operation is automatic.

(Chart changer is product of Barton Instrument Corporation, 580 Monterey Pass Rd., Monterey Pk, Calif.)

Check 2906 opposite last page.

HARRIS MODEL XX-87

NEW HIGH-PRESSURE REGULATOR DELIVERS 0 TO 2500 POUNDS ACCURATELY!



Now available for research and development projects that demand *accurate* high-pressure regulation, Harris Model XX-87 Regulator provides unprecedented high-pressure accuracy. Its 4000/4000 lb. gauges relate fact, not fiction . . . within a new regulator capability range of 0 to 2500 lbs. per sq. in.

Oil refineries, chemical and industrial research laboratories, as well as general industry R&D have found the Model XX-87 to be the solution to high-pressure regulation problems especially for such purposes as hydrogenation, catalytic reduction, calerimetry, accelerated age-testing, and pressure testing.

The timely introduction of the Model XX-87 comes from Harris Calorific's long experience in developing and manufacturing regulators for industrial, commercial, and medical uses, metering regulators, also a complete line of welding and cutting apparatus for virtually all commercially-compressed gases. For more information regarding the XX-87 and other Harris Single- and Multi-Stage, Line, and Gaugeless Regulators, as well as complete manifold systems, call your distributor . . . or write to:

HARRIS

Building World-wide Customer Confidence with Advanced Design Apparatus

THE HARRIS CALORIFIC COMPANY • 5501 CASS AVENUE • CLEVELAND 2, OHIO

HC 3832

Check 2907 opposite last page.

Cambridge pH Meters

The three portable models illustrated above incorporate new and important advantages. A.C. line operation eliminates battery nuisance. Laboratory and Research models use electron-ray tube for precise null-point indication. Industrial model is direct-reading, continuous-indicating; ruggedly built for plant use.

Accuracy: Research .02 pH, Laboratory .05 pH, Industrial .10 pH. Cambridge pH equipment also includes single- and multi-point indicators and recorders. Send for Bulletin 910-M.

CAMBRIDGE INSTRUMENT COMPANY, INC.
1673 GRAYBAR BLDG., 420 LEX. AVE., N.Y. 17, N.Y.

Pioneer Manufacturers of
PRECISION INSTRUMENTS

Check 2908 opposite last page.

MAISCH METERING PUMPS
FOR BIOLOGICAL, INDUSTRIAL OR SANITARY USE

Exploded drawing of Maisch Industrial Pump showing complete accessibility and simplicity of assembly typical of all Maisch engineered pumps.

- Fixed or Variable Capacities
- Positive Displacement, Uniform, Non-pulsating flow
- Extremely Compact Design
- Rigid or Demountable Types

Maisch Metering Pumps are simple in design and ruggedly built for long service. They are widely used for handling chemicals, syrups, oils, glue, processing solutions, etc. They can dispense boiling hot, ice cold, watery, or highly viscous liquids with equal efficiency. Available in wide range of capacities from 0 to 217 GPH. Materials: Biological and Industrial Pumps—Stainless Steel; Sanitary Pumps—Stainless Steel, or Plastic.

Immediately available.

Complete details and prices available upon request.

VARIABLE CAPACITY PUMPS-0-144 GPH

FIXED CAPACITY PUMPS-10-217 GPH

FIXED CAPACITY SANITARY PUMPS-17-152 GPH

mechanical mp products
MECHANICAL PRODUCTS CORPORATION
1772 W. Hubbard St. • Chicago 22, Illinois

Check 2909 opposite last page.

Monsanto Chemical Company's Plastics Division uses a spectrophotometer (right) and a computer (left) to determine proper amount of each colorant needed to exactly reproduce color of customer's sample of styrene molding compound

Delivery schedules slashed by 75% for styrene molding compounds—

Spectrophotometer-computer combo shrinks color-matching time to less than one minute

THE COMPUTER has been proved quicker than the eye — at least in the highly specialized job of accurately matching colors. The technique teams up a recording spectrophotometer and a colorant-mixture computer to precisely measure the color of a material in less than a minute and mathematically describe it in reproducible form.

A NEW SOLUTIONS FEATURE

This color-matching process recently has been moved from the realm of research to that of dollar-saving practicality by Monsanto Chemical Company's Plastics Division in Springfield, Massachusetts. Use of the system has permitted them to reduce delivery time of custom-colored styrene molding compounds by as much as 75%.

The spectrophotometer analyzes the color of each customer's sample to be duplicated. The instrument assigns mathematical expressions to the color's hue, purity and value. The computer is then used to calculate the proper amount of each colorant to match the sample under all conditions of light. Automatic correction is made by the computer for the variable sensitivity of the human eye throughout the color gamut.

For quality-control checks, each production sample is also analyzed by the spectrophotometer. The resultant values are compared to the standards of the customer's sample.

This approach to the color-matching problem has completely eliminated the costly need for sending a production sample to the customer for approval prior

Computing the Right Color

The colorant-mixture computer solves the problem of color matching by displaying on an oscilloscope a series of dots representing a spectrophotometric curve. Each dot represents one of 10 or 16 equations (depending on the model) which are to be solved simultaneously.

Each of these equations represents the sum of the contributions to light absorption made by a dyestuff or pigment at a particular wavelength for the value set on the concentration dial.

If the sum of these contributions equals the light absorption of the standard at that wavelength, the dot representing the equation appears at the zero line on the oscilloscope. If all dots appear on the zero line all equations have been solved and the reflectance of the proposed match equals that of the standard at all wavelengths. Hence the colors will be matched.

The proposed formula is then made up of the chosen colorants at the concentrations shown on the dials of the computer. If the dots do not appear on the zero line, the operator adjusts the concentration dials until they do.

to the full-production run.

In addition, the spectrophotometer automatically produces a graph of reflectance vs wavelength. This graph becomes a permanent "optical fingerprint." If the original fades or is lost, the company can prepare an exact color duplicate from the data.

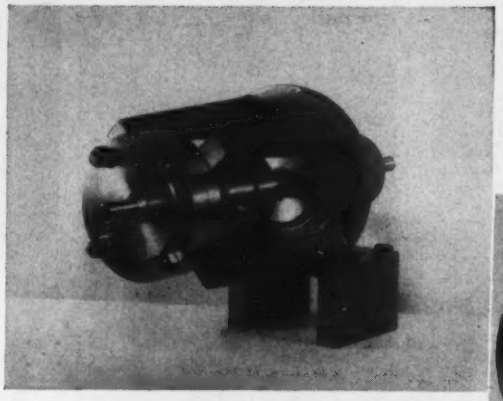
(Recording spectrophotometer 7015E30 is specified in 12-page Bul GEZ-3031 — Instrument Department, General Electric Company, Lynn, Mass.)

Check 2910 opposite last page.

(Colorant-mixture computer is explained in four-page bulletin available from Davidson and Hemmendinger, Easton, Pennsylvania.)

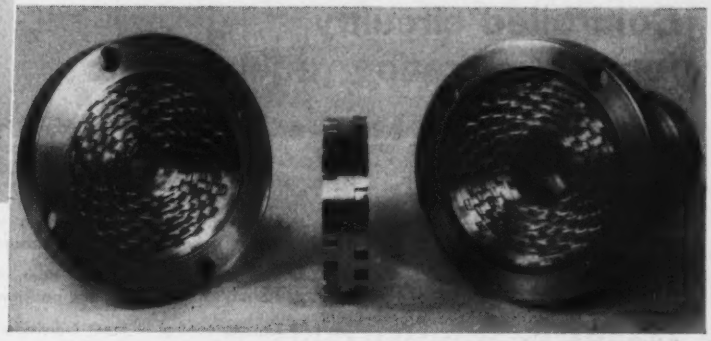
Check 2911 opposite last page.

NEW LABORATORY OAKES MIXER



Exploded view of laboratory Oakes mixing head showing stator and rotor members.

Laboratory Model 4MBH Oakes Mixer for separate motor drive. Another model is available equipped with a direct connected variable speed motor in three horsepower sizes.



For mixing any materials that will flow through pipes. For mass transfer—gas/liquid, liquid/liquid, solid/liquid. To speed chemical reactions. Available in sizes from laboratory and pilot plant up to large capacity production line models.

For the first time, a small size, continuous automatic mixer is available to the chemical industry. The Oakes Mixer, used for years in the food and foam rubber industries, can now be applied to chemical industry processing problems to provide the economies that result from continuous mixing techniques. The new laboratory model Oakes Mixer has been expressly designed to permit experimental work on a small scale in the laboratory.

Oakes Mixers are suitable for continuously mixing all flowable materials and are especially adaptable to multiphase systems. Present installations in the chemical and allied industries, in multiphase liquid/liquid applications, are producing paper coatings, photographic emulsions, polyvinyl acetate and polyvinyl alcohol.

Many Oakes Mixers have been in service for years in gas/liquid applications, producing plastisol foam, adhesive foam, polyester foam and natural and synthetic foam rubber, etc. Laboratory models are being used for experimental work with amino-formaldehyde foam, polyurethane foam, plastics and other chemicals.

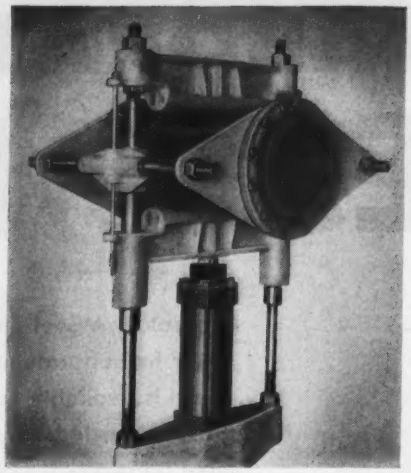
Oakes Mixers are constructed of stainless steel, are exceptionally easy to dismantle and clean, and their simplicity of design makes them extremely trouble-free in operation. They are available in four models ranging from Model 4M for laboratories and pilot plants up to Model 14M for high quantity production.

Test facilities are available at our plant for the purpose of determining the increased efficiency and improved results of employing an Oakes Mixer and for testing new products and applications. Oakes Mixers are also available for investigations in your own plant under actual production conditions.

THE E. T. OAKES CORPORATION

26 COMMACK ROAD • ISLIP, LONG ISLAND, NEW YORK, U. S. A.

AUTOMATED *Hydral-60* PINCH VALVE SYSTEMS



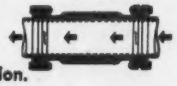
Controlled circuitry for any operating requirements

- The Massco-Grigsby Hydral-60 System consists of one or more pinch valves with a single automatically operated hydraulic pump.
- Hydraulic pump may be operated by electric motor or by air from normal plant supply system.
- Valves may be the same or different size.
- Valves in the system may be operated simultaneously or independently.
- Control valve may be manual or solenoid.
- Valves are self-supporting and may be operated in any position from horizontal to vertical.
- Valves may be coordinated and interlocked with other plant equipment to automatically control tank levels, rate of flow, etc.
- Valves may be independently controlled for normal or rapid closure.
- Valves may be held fully open, fully closed, or at intermediate positions.
- Remote control to meet individual requirements.
- Controls may be included for automatic emergency operation.
- 3" to 14" I.D. sizes, with 50, 100, and 150 psi line pressure ratings.
- Temperatures to 200° F.

Advantages of Massco-Grigsby Pinch Valves

- Rubber, neoprene and special compounded rubber sleeves *for corrosive and abrasive pulps and liquids.*
- Patented "hinged" sleeve. Recesses serve as "hinges" during compression; reduce strain and permit tight closing.

- Unobstructed flow eliminates high friction loss and prevents contamination.



- Split flanges and patented Flex Seal ends assure perfect seal.
- Rugged, heavy duty construction for most severe service and long life.
- Cannot leak or stick.
- No working parts in contact with pulp or liquid; no packing glands.

WRITE FOR NEW CATALOG NO. 609

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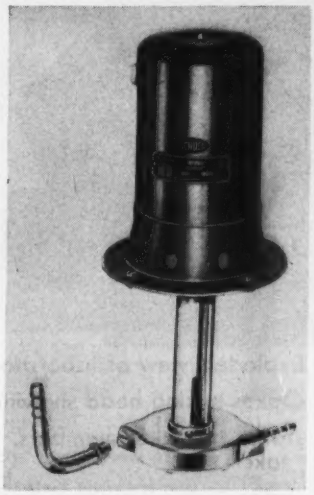
Sales Agents in Mexico, Peru, Chile, Philippine Islands, Japan, New York City (for Continental Europe) and in principal cities of the U. S.

Check 2912 opposite last page.

Pumping small amounts

. . . for laboratory and small-production uses is duck soup for miniature pumps which are adaptable to variety of tasks.

Each pump is supplied with outlet plug permitting choice of running unit with one or two outlets and "L" tube for



connecting hoses in vertical position. They are available in two models of either 1400 or 2700 rpm, motors. Former will pump against max head of 0.65 meters with flow rate of 0 to 8 liters/min. Latter will pump against max head of 3.5 meters with flow rate of 0 to 30 liters/min.

(Heto pump is product of Schuco Scientific, 75 Cliff St., New York 38, N.Y.)

Check 2913 opposite last page.

Circular-chart recorder is normal-meter size

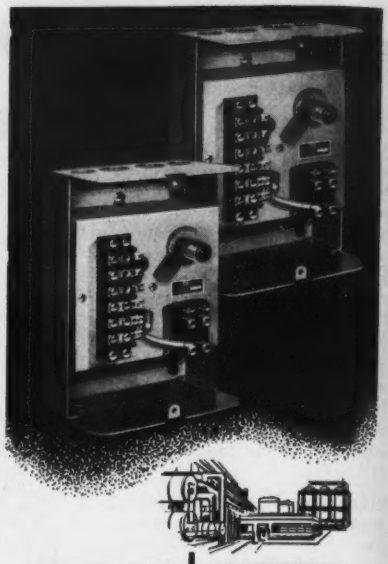
Uses: Recording any variable which can be converted into an electrical signal.

Features: Recorder is as small as a conventional meter.

Description: Circular-chart recorder is 3¾ x 3¾ x 3" deep. It requires no pen, ink or ribbon. Graph is printed by means of stylus on pressure-sensitive paper.

Four basic types of meter movements are available. D'-Arsonval, cross-coil, moving-

Versatile new electronic relays END PRODUCT CONTAMINATION *on level control applications!*



B|W

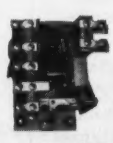
Electronic Liquid Level

CONTROLS

Now—two new performance-proved electronic relays that provide accurate, reliable, floatless means of controlling any conductive liquid or moist bulk material having a resistivity of up to 12.5 megohms!

☐ Outstanding features and characteristics include: Positive means of adjusting sensitivity for specific applications. Very low electrode potential and low electrode current. No shock or sparking hazards. No product contamination due to electrolysis. Quick and easy conversion for direct or inverse operation. And, because both relays will operate several miles away from the level sensing electrodes, they permit accurate control of liquids from remote locations.

Other reliable B/W Floatless Liquid Level Control Equipment



Induction Type Relays

Automatic Alternators

Signals and Alarms

Electrodes and Holders

Complete technical data available upon request—write today!

THE B|W CONTROLLER CORPORATION

2200 E. MAPLE ROAD • BIRMINGHAM, MICHIGAN

Manufacturers of Liquid Level and Industrial Meter Controls

Check 2914 opposite last page.

iron, and ferrodynamic. Gear-shift mechanism in form of built-in three-position sliding lever provides three-speed adjustment of chart rotation.

(Omnicorder is product of Instrument Division, McGraw-Edison Company, Thomas A. Edison Industries, 61 Alden St., West Orange, N.J.)

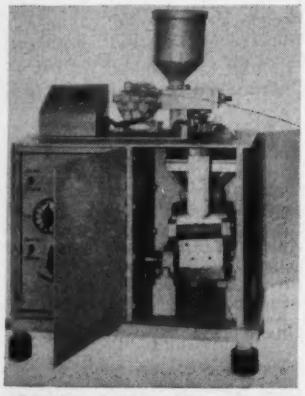
Check 2915 opposite last page.

Screens and air stream remove particles from sample grinder

Uses: Grinding samples for spectrographic analyses.

Features: Grinder incorporates use of screens and air stream to remove particles from grinding chamber while grinding is going on, and as soon as they reach predetermined size.

Description: In operation of particle-size grinder, sample material in coarse form (3/16" diam), is either batch loaded or fed from mechanical feeder



Particle-size grinder uses screens and air stream to remove particles from grinding chamber during grinding as they reach predetermined size

into cylindrical grinding chamber which is shaken at high-speed by eccentric mechanism. Chamber contains balls to accomplish particle size reduction.

Air stream is directed through chamber from one to other at relatively low pressure (8 to 15 psi) and is reversed in direction at rate of 200 or more times per minute. Reversal of air path cleans

WATER STILLS
Capacities from ½ to 500 gal./hr. Steam, Electric or Gas Heat.

STERILIZERS
Pressure Steam, Gas-Steam, and Gas. Chambers 16″ x 16″ x 24″ to 60″ x 66″ x 120″.

TALK MICROBIOLOGICAL EQUIPMENT . . .

and you have to talk to American Sterilizer!

● Here at Amsco, sterilization is still of prime concern. However, to parallel the great strides of modern biological technology, we've developed a number of highly specialized microbiological devices—all designed to do their job better with less personnel time and attention and at a cost well within practical limits.

If you've a problem in this area, a letter to our Scientific and Industrial Department may lead to its economical resolution.

BIOGEN • *continuous culture apparatus*
For batch or continuous culture of pure microorganisms in controlled conditions.

DRY BOX
Flexible film chamber. Efficient, economical, easy to work with.

FREEZE DRY APPARATUS
Laboratory, pilot plant and production models. Used for the preservation and concentration of labile substances.

GERM FREE LIFE APPARATUS
Complete service, including flexible operating, rearing and transfer chamber.

SCIENTIFIC AND INDUSTRIAL DEPARTMENT

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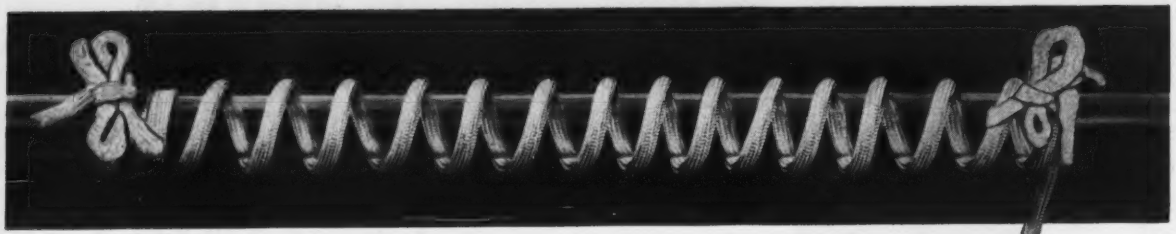
World's largest designer and manufacturer of Sterilizers, Operating Tables, Lights and related biological equipment

Check 2916 opposite last page.

Wrap up high temperature laboratory heating problems fast with new CAL-CORD*



Here's news from Glas-Col . . . a new, flexible cord developed especially for high temperature laboratory heating applications. It's easy to use . . . as flexible as an appliance cord . . . and delivers uniform temperatures. Cal-Cord comes complete with cord and plug. There are no troublesome loose terminals on the ends.

TWO SIZES—400°C and 600°C

Medium "Cal-Cord"—400°C Specifications

Catalog No.	Length	Wattage	Price
C-C 2	2-ft.	80W, 115V	$ 6.50
C-C 3	3-ft.	120W, 115V	9.00
C-C 4	4-ft.	160W, 115V	11.00
C-C 6	6-ft.	240W, 115V	15.00

Made of glass fabric materials. Can be furnished for 220V operation.

Super "Cal-Cord"—600°C Specifications

Catalog No.	Length	Wattage	Price
SC-C 2	2-ft.	200W, 115V	$ 8.00
SC-C 3	3-ft.	300W, 115V	13.75
SC-C 5	5-ft.	500W, 115V	18.00

Made of quartz fabric materials. Can be furnished for 220V operation.

CAL-CORD TEMPERATURE CONTROL

This Thermolyne Stepless Type 800 temperature controller, recently developed, is ideally suited for use with "Cal-Cords." It's a 115V unit. Maximum amps: 13. Watts: 1500. Price $15.75.

*Patent Pending

Write for information on "Cal-Cord" today!

GLAS-COL Cal-Cords

Dept. CP, 711 Hulman St. Terre Haute, Indiana

World's largest manufacturer of heating mantles for laboratory, pilot plant, and chemical process heating applications.

Check 2917 opposite last page.

screens while at same time accomplishing removal of particles to collector. Screens are available as fine as 450 mesh.

(Particle-size grinder is product of Pitchford Scientific Instruments Corp., 501 Castle Shannon Blvd., Pittsburgh 34, Pennsylvania.)

Check 2918 opposite last page.

NEW LITERATURE

Process Instrumentation and Laboratory Apparatus

Chemical spot testing of micron sized aerosols is described in technical information manual which deals with identifying the chemical composition of particles deposited on the surface of a membrane filter. Booklet describes method for conducting tests and gives list of references. Manual No. 14 — Gelman Instrument Company.

Check 2919 opposite last page.

Multipoint recorders, strip and circular chart recorders and precision indicators are all treated in 48-page catalog which covers design and construction features, applications and available measuring elements. Catalog C 15-1a — Minneapolis-Honeywell Regulator Company, Industrial Division.

Check 2920 opposite last page.

Amino acid analyzer is described in 12-page, well-illustrated brochure. Reproductions of actual charts show form of analysis curves produced on a series of typical materials. A full table of general specifications is included. Brochure S-158 — Beckman Instruments, Inc., Spinco Division.

Check 2921 opposite last page.

How to solve multi-component phase equilibrium problems with an analog computer is subject of seven-page report. Method disclosed is generalized and can be used for any number of components. A wiring diagram is included which shows circuitry common to all components plus that peculiar to only one component. Form 80-105-009 — Computer Systems, Inc.

Check 2922 opposite last page.

Liquid flowmeter of integrating type is accurate to ± 1% at any flow rate from zero to full rated capacity. It is presented in Circular 26L—Central Station Steam Co.

Check 2923 opposite last page.

Use of nuclear gages for rapid field determination of moisture and density in soils, aggregates, concrete and asphalt is described in six-page brochure that includes full specifications for the gage. "d/M-Gauge System" — Nuclear-Chicago Corporation.

Check 2924 opposite last page.

Instrument tube of all types is tabulated in 12-page Bul 380—Superior Tube Company.

Check 2925 opposite last page.

Determining presence of calcium down to parts per million at a rate of 20 analyses per hour is subject of a two-page data sheet which describes the analytical procedure in detail. Bul CIa — Technicon Controls, Inc.

Check 2926 opposite last page.

Infrared, photo-electric control for materials handling, accounting, inspection and other applications is illustrated with detailed specifications and descriptions of models and accessories in eight-page bulletin. "Infrabeam" catalog — Cramer Controls Corporation, Electronics Division.

Check 2927 opposite last page.

Digital logger is packaged unit designed to log digitally up to 50 process variables. Full explanation of its principles and specifications on the unit are included in four-page Product Data P1212.1-2—The Bristol Company.

Check 2928 opposite last page.

Air transmitter, of cable-operated type produces pneumatic pressures proportional to speed of rotation of primary unit. It is covered in one single-sheet Ref. 86.20-1—B-I-F Industries, Inc.

Check 2929 opposite last page.

Control-volume pumps are topic of 32-page bulletin featuring data guide, materials-selection charts and capacity-selection tables. Bul 553-2—Milton Roy Company.

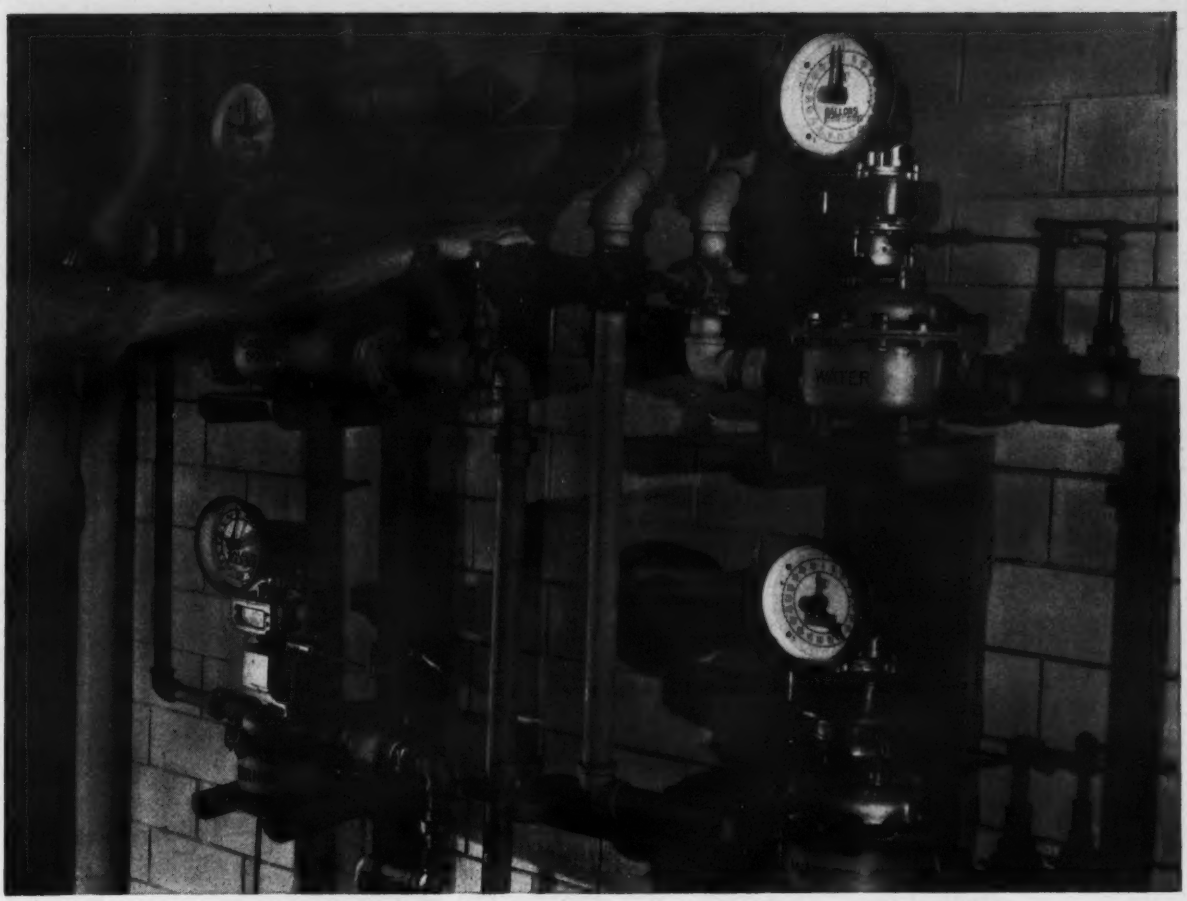
Check 2930 opposite last page.

Lever-actuated control valve for liquid-level applications has max inlet pressure of 400 psi. Initial details are incorporated in Bul 171—American Meter Company.

Check 2931 opposite last page.

Chromatography and paper-electrophoresis equipment is depicted in 32-page catalog picturing, among other things, Gordon-Misco multiple-cell electrophoresis apparatus with organic buffers. Cat CP 60—Will Corporation.

Check 2932 opposite last page.



Meters with "mechanical brains" do your thinking at less cost

For controlling formulas, a Rockwell liquid meter thinks for itself. Once pre-set, it remembers the quantity, and shuts off automatically after each operation. Optional accessories include ticket printers for inventory and cost analysis; impulse contactors for remote registration; even controls to shut off the pump after delivery.

With this meter system there is no waiting for gauge tanks to fill, no bucketing, no errors, spillage or waste. In many cases one man can progressively formulate several batches at the same time.

You'll benefit through more production with improved quality at less cost. If you are handling volatile liquids, you'll gain the safety of a closed piping system.

Rockwell liquid meters are sold by jobbers everywhere . . . and supported by our own staff of field engineers. Use the handy coupon or write to Rockwell Manufacturing Company, Dept. 131C, Pittsburgh 8, Pa. In Canada, Rockwell Manufacturing Company of Canada, Ltd., Box 420, Guelph, Ontario.

INDUSTRIAL METERS
another fine product by
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Clip Coupon—Mail Today

Rockwell Manufacturing Company
Dept. 131C, Pittsburgh 8, Pa.

I am interested in measuring _____ (Name of liquid) • Pipe Size _____

Working pressure _____ psi • Temperature _____ °F max.

Max. Flow Rate _____ gpm • Min. Flow Rate _____ gpm

Your Name _____

Company _____

Street _____

City _____ Zone _____ State _____

Check 2933 opposite last page.

200 Cl_2 cells outdo 5000

Pennsalt discloses that its $6 million modernization and simplification program is paying out, finds that benefits are being reaped all the way around

By **TED F. MEINHOLD**
Associate Editor

A NEW SOLUTIONS FEATURE

BEFORE: Cell room at Pennsalt had 5000 cells, occupied 78,000 sq ft floor space

NOW: An example of the latest in electrolytic cells, these 200 diaphragm-type units produce more chlorine than the 5000 cells they replaced. Added bonus: They use two-thirds less floor space

Problem: Veteran diaphragm, cylindrical-type, electrolytic chlorine-caustic cells — 5000 in all — had reached a point where they were considered to be obsolete and no longer economical to operate at the Wyandotte, Michigan, plant of Pennsalt Chemicals Corporation. Units required almost constant attention to keep functioning properly. Maintenance and repair costs were excessive. The large number of cells made it difficult, under today's labor and operating costs, to meet production schedules and maintain reasonable cost levels.

Product loss due to leakage was bad. Individual connections for recovery of each of the three products (chlorine, caustic soda and hydrogen) meant that there were a total of 15,000 potential leakage points that had to be closely checked.

Originally the units could turn out about 50,000 tons of chlorine per year. However, studies of yields and production potentials indicated replacement with new, larger cells could be justified economically.

Each of the cells had a current rating of 1100 amperes. Units measured 22" in diam by 36" high. Overall floor space requirements for the 5000 cells was 78,000 sq ft.

Solution: Since production demands were steadily climbing — and were expected to continue to do so in the future — it was decided to go "all out" on a huge $6 million plant modernization program. This was to be the largest single renovation project ever tackled by the company.

Select Diamond D-3 Cells

Most important, of course, were the cells, which would be replaced by 200 recently developed Diamond, D-3 diaphragm cells, rated at 30,000 amperes. Know-how on cell and its maintenance was acquired from Diamond Alkali Company under a license agreement.

The program was also to include a new caustic evaporation system (discussed later in greater detail), hydrogen and chlorine cooling and scrubbing equipment, and changes in electrical accessory units.

To maintain as much productive capacity as possible during the transition period, the project was carried out in four major phases. Caustic evaporating and brine treatment facilities were installed first. In January 1960, a portion of the old cell room was taken off stream. Electrical panels, rewinding of generators, cell renewal facilities, etc. were also put in at this time.

In April 1960, a deeper cut was made in the production of the old cells — dropping output down to about 54%. First series of new cells went into operation on June 10. Final cut in old cell output was made on June 20. By June 30, third and final series of new cells went into production, completing the cell room modernization on schedule.

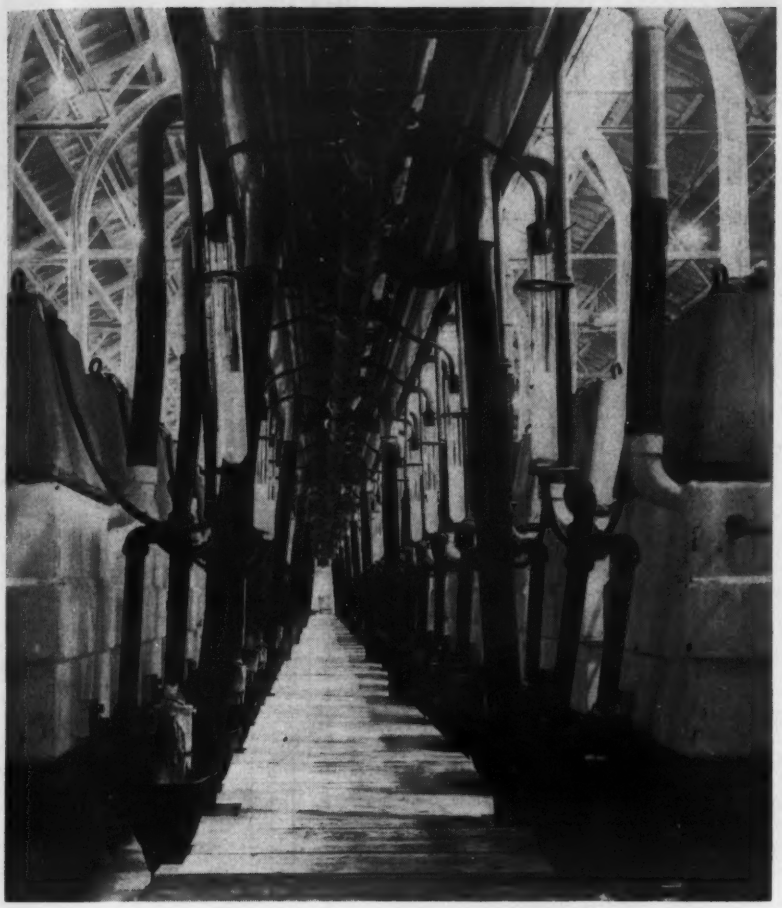
The new cells are made of steel and concrete. Each unit measures 4′ x 7′ x 4′9″ high. Since there are now only 200 cells instead of 5000, space savings are considerable.

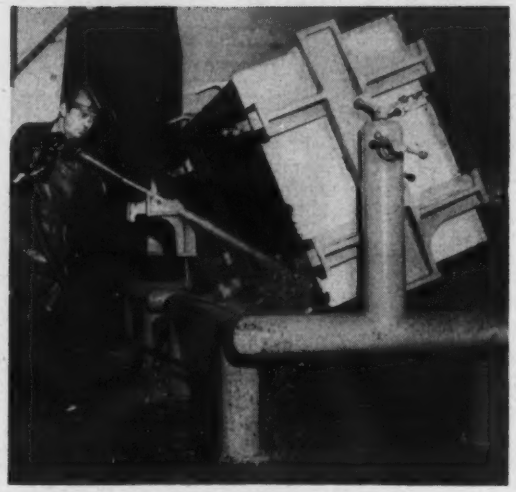
Cell Room Shrinks 66%

Total area of the cell room is 26,000 sq ft, which is 66% less than that occupied by former units.

Only general type information has been released about the design, construction and operation of the cells. It is known that, like the Hooker cells, anodes are graphite plates fully encased to prevent leakage. Cathodes are covered with porous asbestos which forms diaphragm and is fully submerged.

Some of the photographs accompanying this article reveal piping details. Chlorine





Using positioning jig and water hose, maintenance man flushes spent asbestos from electrolytic cell into disposal pit

Close-up view of pipe and connections serving double bank of cells. Glass pipe removes chlorine from cell top. Pipe with rubber connection carries hydrogen. Caustic collects at bottom

is removed by glass pipe from top of cell. Hydrogen leaves unit at side through rubber-connected metal line. Caustic is collected in header running along bottom of cells.

The Diamond cells operate at higher temperatures than former units. Caustic now contains 8 to 11% less moisture because of this. Product can be used for all purposes except making rayon. Lower moisture content of caustic also simplifies subsequent evaporation operations.

The new cell room was designed to simplify cell renewal operations. Cell rebuilding section is now located much closer to main cell area. Units can be removed quickly by overhead cranes and transferred to maintenance section. Using a positioning jig, operator can flush spent asbestos material from cell into disposal pit especially installed for this purpose. Components of cells have been found to have longer life than previous units, require rebuilding less frequently.

Nickel Evaporator-crystallizers

In modernizing the caustic evaporation system, Pennsalt replaced six outmoded, 225 tpd iron evaporators with two nickel-constructed crystallizing evaporator units. The new evaporation system is a novel design development by Pennsalt's operating engineers. Any existing nickel equipment was retained. To further insure absence of iron contamination, all iron cooling tanks and auxiliary facilities were replaced by nickel equipment. A modern control room was added for the evaporators.

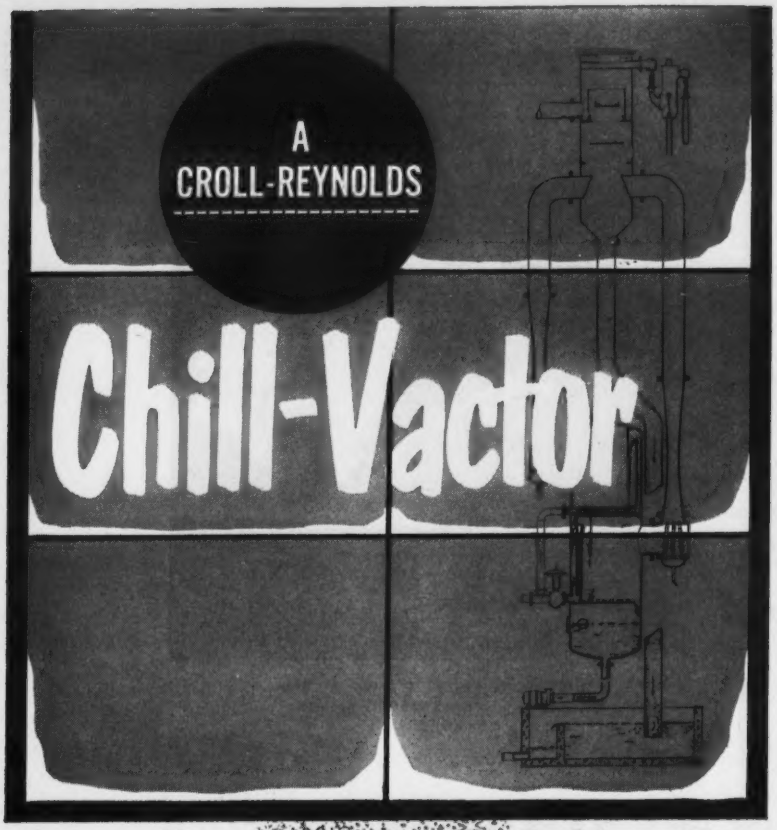
Formerly, caustic liquor evaporation and processing was conducted in three separate areas — which resulted in excess plumbing and congestion. The new setup centralizes the operation in one location. Building area devoted to evaporation and salt recovery has consequently been reduced by 3000 sq ft.

The first of the new evaporators-crystallizers, a backward-feed, double-effect unit, concentrates cell liquor to 30-33% NaOH. NaCl crystallizes out under controlled conditions and is separated from liquor. Remaining NaOH is then concentrated to 50% in a single-effect evaporator. Effluent, consisting of NaOH, salt crystals, and sodium sulfate as triple salt, is passed through two cooling crystallizers where it is cooled to 80-85°F.

Suspended salts are removed from the 50% NaOH in a centrifuge and passed into a decomposing unit where triple salt is decomposed into its components. Sodium sulfate is separated from NaCl by classification in a fluidized suspension and discarded. NaCl from decomposer is combined with the NaCl initially removed after the double-effect evaporator-crystallizer and recycled back to brine preparation area.

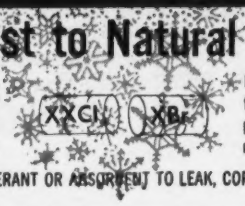
Because the system is operated with controlled supersaturation, evaporator-crystallizers run for long periods of time without need for washout. Such periods have at times exceeded one month. This has also contributed to higher caustic yields.

Results: Although there are now 4800 fewer electrolytic cells, production of chlorine, caustic soda and hydrogen has risen. Installed cell capacity is rated at 57,000 tons chlorine



Comes Nearest to Natural Refrigeration

Nature produces refrigeration (snow, sleet, and hail) indirectly by change of atmospheric pressure to bring warm water vapor in contact with cold air.



In each case, water is its own refrigerant or cold air serves the purpose. Jet vacuum refrigeration comes nearest to this natural refrigeration.

NO CHEMICAL REFRIGERANT OR ABSORBENT TO LEAK, CORRODE OR CRYSTALLIZE

As a method of industrial refrigeration, jet vacuum refrigeration is thoroughly established and is successful in many hundreds of industrial plants in capacities varying from a few tons to 4500 tons.

The unit sketched can be placed outdoors and operated continuously or intermittently in any climate. The equipment adapts itself readily to automatic control or is very easy to control manually. The unit is self-supporting. There are no moving parts, no noise, no vibration. The maintenance and supervision required are negligible.

While most vacuum installations are used to cool water, vacuum cooling is particularly efficient for cooling chemical solutions. Instead of the usual expensive heat transfer surface required, only simple corrosion resistant vessels are needed. Some process plants have dozens of separate units totaling thousands of tons of refrigeration just for the purpose of cooling chemical solutions.

There are many other applications, too. Fresh vegetables and other moist solids are readily cooled by jet vacuum refrigeration. By adding a heat exchanger bundle inside the vacuum chamber, gases can be cooled without circulating any liquid. In some cases, the automatic de-aerating effect of vacuum cooling is important.

Many installations of old style mechanical refrigeration could be replaced profitably with vacuum refrigeration, which costs much less to buy and somewhat less to operate.

All inquiries will be given careful engineering study without obligation.

CROLL REYNOLDS

Croll-Reynolds CO., INC.

Main Office: 751 Central Avenue, Westfield, N. J.

Chill-VACTORS® • Steam-Jet EVACTORS® • Aqua-VACTORS® • Fume Scrubbers • Special Jet Apparatus

Check 2934 opposite last page.

per year, but designed for about 10% more. Automatic controls assure rigid control on quality of finished products. Cell supervision and maintenance is easier. Product losses due to leaks have been sharply curtailed (reduction to 200 cells has cut leak potentials from 15,000 to 600). Overall operating economies have been greatly improved.

New cells are easier to remove from the line. Experience has shown that anodes and cathodes last longer than on the former units. Although there is a continuous program of cell rebuilding going on, percentage of nonproductive units, time required for rebuilding and manpower costs are lower.

New floors that were installed along with the cells have made the cell area brighter and cleaner. This, combined with the sturdier, encased cells, has resulted in improved working conditions and better employee morale.

More and Better Caustic

As indicated before, the new cells also make a purer grade of caustic. Product output has gone up over 20%. The new system is rated at 275 tons per day NaOH, compared to 225 for the old. Caustic losses — due to entrainment, pump and valve packing leakage, and operating errors — have been cut about 60% because of improved design and elimination of numerous sources for such losses. (There has been a substantial reduction in the number of motors, pumps and auxiliary devices).

Overall steam economy for caustic evaporation has increased approximately 20%. Another important benefit realized with the new evaporator-crystallizers is substantial reduction of boil outs and clean-outs that were necessary with the iron units.

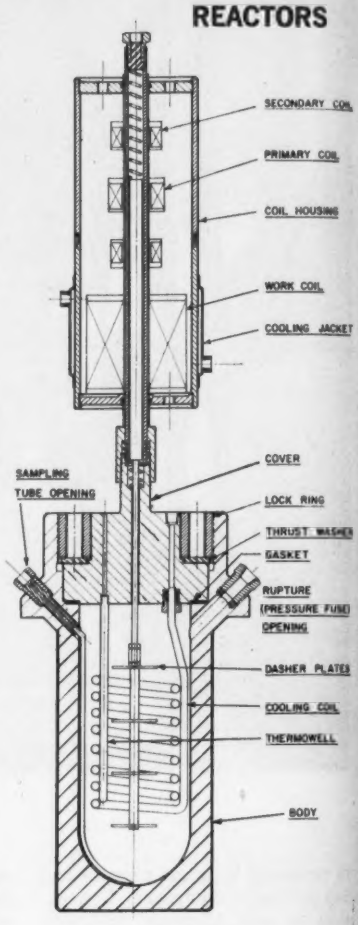
There is more salt recovery with the new system too. This reduces amount of salt that the plant has to put through its brine purification system. It also cuts down on amount of salt that Pennsalt has to harvest from its beds along the Detroit River.

Smaller amount of salt

MAGNETICALLY AGITATED

RECIPROMIX

REACTORS



- No stuffing box.
- Pressures to 30,000 p.s.i.
- Sizes—from 100 ml. to 50 gal.
- Heating—electric or vapor.
- Cooling—internal coil or externally grooved body.
- Timers—mechanical or automatic electronic.
- Power—ample for all types of mixing.
- Voltage—110 or 220, 60 cycle, single phase

PRESSURE PRODUCTS INDUSTRIES, INC.

Hatboro, Pa. OSborne 5-1600

Manufacturers of laboratory and pilot plant pressure equipment

Check 2936 opposite last page.

ECO ENGINEERING NEWS

the big name in small pumps for the process industries

Pumping Notes

•

Metering Melamine Resin Solution. A Massachusetts paper mill uses Eco GEARCHEM Pumps to add melamine resin to paper stock to impart wet strength. Superintendent has found that continuous flow metering directly to the fourdrinier head boxes, with GEARCHEMS, offering ± 1 per cent reproducible accuracy, provides excellent results.

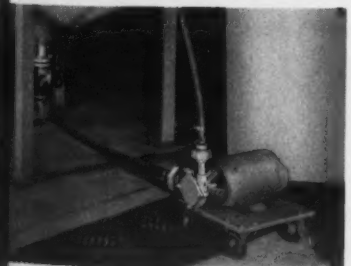
Pumping Sulphuric Acid. A South Texas cotton oil processor recently returned a CENTRI-CHEM Pump for its first complete parts overhaul after two years in sulphuric acid service. Is this typical of the life expectancy of this Carpenter 20 stainless steel pump in sulphuric acid service?

Life expectancy in chemical pumps is always a devious problem as slight temperature, viscosity, pressure or concentration changes can materially reduce or increase mechanical life. The above experience is average. Other CENTRI-CHEM pumps have been in operation in sulphuric acid service for about four years. Some have been shortlived due to misapplication on acid temperatures beyond the range for which Carpenter 20 stainless steel is recommended.

Pumping Inhibited Styrene. A large synthetic sponge manufacturer, utilizing inhibited styrene, selected the self-priming GEARCHEM Pump in 316 stainless steel for transfer of medium from drums to reactors.

Pumping Calcium Chloride Brine. A leading petroleum research laboratory found that it can best handle calcium chloride brine with an Eco GEARCHEM Pump in Hastelloy* B.

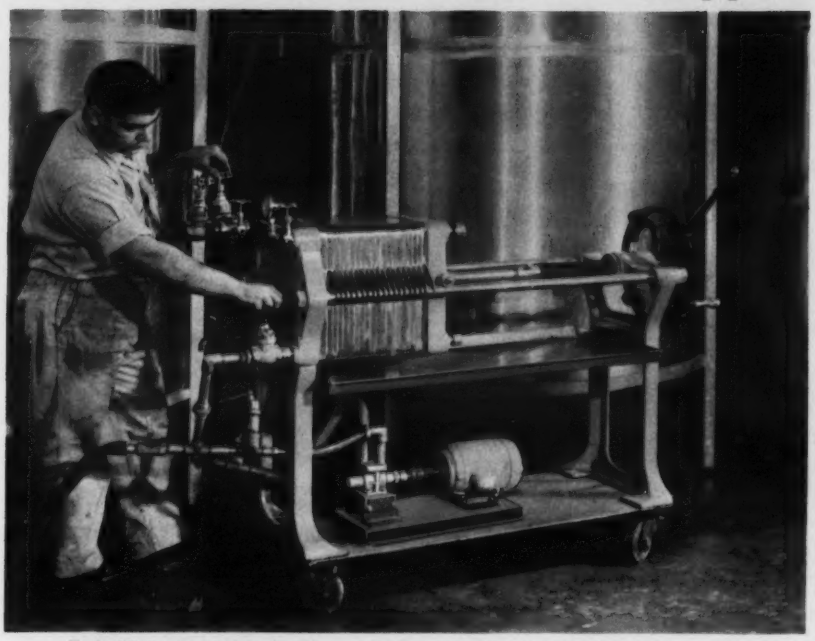
Pumping Viscose Resin. Polycarbonate resin in a chlorinated solvent vehicle, with viscosity of about 2450 SSU at temperatures from 50 to 200°F is successfully handled with a GEARCHEM Pump in 316 stainless steel with Hastelloy gears.



Pumping Acid Solutions of Rare Earths. Eco CENTRI-CHEM Pumps are dolly-mounted, moved from system to system as the cycle of operation progresses in these ion exchange installations at a mid-western processing plant.

Union Carbide Trademark

Face Creams Can't Be Whipped



To facilitate use at many locations in batch processing, this ALL-CHEM Pump rides with the pressure leaf filter it serves. Dual manifold also permits by-passing the filter press for other pumping services.

Many of the materials and semi-finished products handled by Paris Cosmetics, Inc., in their manufacture of face creams, lotions, lipsticks, rouges, etc., for leading cosmeticians—could easily be whipped into unbelievable, unmanageable froths if pumped by ordinary equipment.

That is why Paris uses Eco ALL-CHEM Pumps with their linear, non-foaming flows, ideal for shear sensitive emulsions, in transferring all these compounds from one process to the next.

Perfect for Filter Press

A typical use of these ALL-CHEM Pumps at Paris is pumping compounds from one holding tank to another via a pressure leaf filter. Maximum pumping rates are 10 gpm against low heads of approximately 12 psi.

Handles Warm Waxes

Paris has found that the ALL-CHEM Pump is also ideal for pumping waxes at temperatures of 75° to 80° C. Other basic materials pumped include alcohols, glycerines, fatty acids.

Portable Units for Batch Compounding

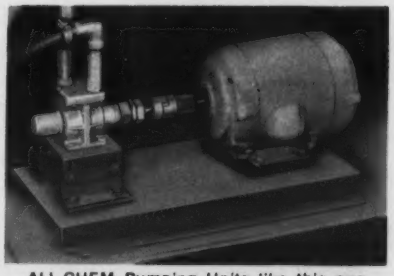
Process steps and materials vary with each product and customer specifications; hence compounding at Paris Cosmetics is, by necessity, a batch operation. For this reason, the ALL-CHEM Pumps are mounted as portable units so that they provide the greatest convenience and flexibility of use.

These pumps, like all other processing equipment and piping, are constructed of 316 stainless steel, with Teflon† impellers and bearings for positive, non-contaminating service.

Pumps Withstand Abuse

Paris reports good service on all their ALL-CHEM Pumps, despite the continual hazard of abuse by mechanically inexperienced personnel. ALL-CHEM Pumps have been standard equipment at Paris Cosmetics since 1956.

†du Pont Trademark



ALL-CHEM Pumping Units like this one have been in continuous service for periods up to 4 years with a minimum of repairs.

More Power to NICAD Batteries

A temperature check of the potassium hydroxide bath at NICAD reveals that CENTRI-CHEM recirculating pumps have solved the problem of keeping uniform temperature throughout the bath.

Gould-National Batteries, NICAD Division, St. Paul, make the famous NICAD rechargeable sealed batteries, hailed by sportsmen and widely used in cordless electric shavers.

An important step in the production of these nickel-cadmium batteries is the impregnation of the plates by immersion in hot solutions of potassium hydroxide and nickel nitrate. In this process, temperature and concentration of the bath solutions must be kept uniform to insure uniform high quality to meet Gould-National standards, and reduce rejects.

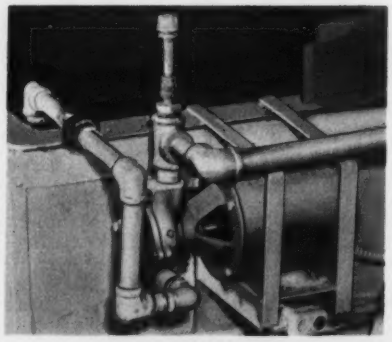
Simple immersion in static solutions was not satisfactory as stratification of the solutions presented varying temperatures and concentrations in different areas in the tanks.

To overcome this difficulty, Gould-National employs Eco CENTRI-CHEM Pumps of Carpenter 20 stainless steel to continuously recirculate, agitate and mix the hot corrosive bath solutions, without contamination of the media.

The CENTRI-CHEM Pumps draw the solution from the top of the tanks, which are heated by means of water jackets, and then pump it through a pipe manifold to the distribution nozzles in the bottom of the tanks.

The resulting turbulence assures uniform concentration and temperature of solution at every point in the tanks—hence all battery plates receive uniform exposure.

Results: fewer rejects, increased production, lowered costs, a uniformly better product.



These non-contaminating CENTRI-CHEM Pumps of Carpenter 20 stainless steel throughout, recirculate hot caustic solution at the rate of 10 gpm in each immersion tank.

ECO Products for Handling Corrosive and Hazardous Processing Fluids

ALL-CHEM® Rotary Pumps
MINILAB® Rotary Pumps
GEARCHEM® Gear Pumps
CENTRI-CHEM® Centrifugal Pumps
PUMPMOBILE® Portable Pumping Units
GEAR-VAC® Valves
CHEMICAL DISPENSING VALVES
Factory Mutual Approved

Ask for literature on any or all of these ECO Products

Something to Get Your Teeth In

Acco Polymers, a division of Acralite Co. Brooklyn, N. Y., manufacture acrylic polymers used in the molding of dentures which cure at low temperatures, without distortion, thus assuring superior fit and dimensional stability.

These American Dental Association approved materials—as well as other polymers, custom compounded to meet individual customer specifications—require extremely exacting processing procedure.

Almost Pilot Plant Scale

Consequently, Acco's manufacture is quite different from that of other giant firms in the plastics industry.

Production is planned on almost a pilot plant scale and all equipment must meet exacting requirements of performance and dependability.

Acco Selects Eco

Four years ago, Acco faced the selection of a pump type most suitable for their requirements in handling methyl methacrylate and other monomers from drums to reactor and to transfer intermediate liquids from reactor to evaporator or other process equipment.

The Eco ALL-CHEM Rotary Displacement Pump in 316 stainless steel with Teflon impellers, bearings and seals, was selected.

Very Little Maintenance

Today, after four years of experience with this Eco Pump design, Acco is still highly pleased because, according to Mr. Rubinstein, plant manager, "It is a pump we can depend upon. It has never caused us any lost time in polymer production. It requires very little maintenance—only occasional replacement of Teflon Bearings or packing."

ASK FOR LITERATURE

passing through purification system permits brine to settle longer, results in less impurities in brine going into cells. This factor also plays major role in assuring longer cell life and better efficiency.

Turbo-generator Next

To provide increased flexibility and more uniform production from its electrical equipment, a new 2500-kw turbo-generator will soon replace one of the existing units. Included are revisions to the condenser, transition piping, circulating water, condensate pumps, air ejector units and accessories. The generator will be especially useful during periods when the power plant cuts its low-pressure steam load, or when boost in load is required for short periods of time. The cell room now consumes about two-thirds of the power plant's 40,000-hp output.

(Further information about use of Diamond D-3 electrolytic cells on license basis may be obtained from Diamond Alkali Company, Union Commerce Building, Cleveland 14, Ohio.)

Check 2937 opposite last page.

(Krystal® evaporator-crystallizers used in process were designed and manufactured by Struthers Wells Division, Struthers Wells Corporation, Warren, Pennsylvania.)

Check 2938 opposite last page.

(Plant was constructed by Catalytic Construction Company, 1528 Walnut Street, Philadelphia 2, Pennsylvania.)

Check 2939 opposite last page.

Magnet-filter combo is effective

Assures removal of metal particles from liquids

Uses: Removing metallic particles from fluid streams.

Features: Magnets used in conjunction with filter screen results in effective removal of foreign objects.

Description: To insure peak efficiency, magnets are lo-

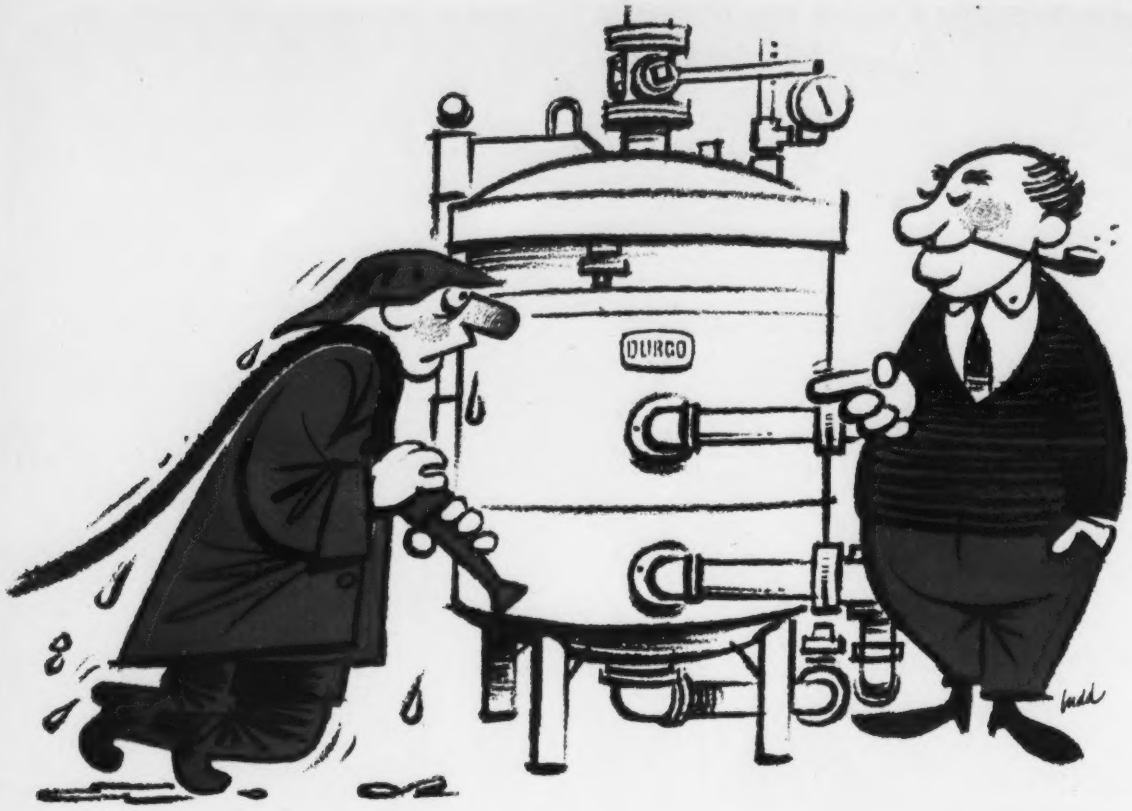
Only 'round the clock screening meets Maas' custom requirements

SWECO Vibro-Energy Separators operate 24 hours a day, seven days a week, at A. R. Maas Chemical Co., division of Stauffer Chemical Co., South Gate, Calif. Costly down-time and maintenance ordinarily caused by screen blinding are reduced to a minimum with SWECO's effective ball tray design. Maas installed one of the first SWECO Separators in 1953. Today, seven 48-inch, multiple-deck units handle its production of photo chemicals, organic chelating agents, and a complete line of sodium phosphates, all to exacting customer specifications. Units transmit no vibration so are easier and more economical to install, and they use only 1/3 of the normal power required. The SWECO Separator's quick screen change and longer screen life cut operating and maintenance costs. For full details, application data, or free screening demonstration in *your* plant with *your* materials, write SOUTHWESTERN ENGINEERING CO., 4800 Santa Fe Avenue Los Angeles 58, Calif., Dept. 30-3.

SWECO

+Vibro-Energy separators, grinding mills, finishing mills +

Check 2940 opposite last page.



...HANG UP THE HOSE, HENRY!

This filter sluices with the lid on.

Durco-Enzinger engineers have developed automatic sluicing to handle any filter cake—even the thin, slimy ones.
Oscillating sluice—a solid jet stream moves back and forth across the face of each leaf.
Rotosluice—for horizontal tank filters. The sluice jet rotates through 360°, and a screw conveyer removes the cake from the tank.
Traveling sluice—designed for the most difficult cakes. High pressure sprays move down the face of each leaf.
Hydrojet sluice—permanently positioned spray nozzles in the cover sluice the entire surface of each leaf. Coupled with an air sparger this provides the simplest method of handling average sluicing jobs.

Contact your local Durco sales engineer or write for informative Bulletin EF/2a.

DURCO
ENZINGER DIVISION

THE DURIRON COMPANY, INC., Dayton, Ohio / Filters • Valves • Pumps • Process Equipment

Check 2941 opposite last page.

cated beyond screen, in that part of flow path where fluid velocity is lowest. Magnet assembly is separated from

Magnet assembly can be easily separated from screen for cleaning

screen element and is attached to simple clean-out cover. Screen can also be used without magnets, if desired.

(Tell-Tale filters are product of The Rosaen Company, 1776 E. Nine Mile Road, Hazel Park, Michigan.)

Check 2942 opposite last page.

Bi-media filter cartridge traps fine particles with ease

Design assures uniform flow, minimizes plugging

Features: Cartridge is designed to trap the progressively finer particles as they travel from outside diameter towards core, assuring more uniform flow rates with minimum plugging.

Description: Cartridge uses separate filtering medium that is interwoven between its structural spiral winding. Units are made with cellulose winding yarn and cotton fiber. Cores are heavy-gage, perforated metal.

Standard dimensions are 1" core by 2½" OD by 9⅞" overall length. Cartridges are wound square with the core axis. This permits a number of cartridges to be assembled end-to-end in tiered arrangements without sealing devices when installed in a suitable filter housing. Density of filters is from 10 to 75 microns.

(Micro-Wynd disposable filter cartridges are product of Cuno Engineering Corporation, 80 South Vine Street, Meriden, Conn.)

Check 2943 opposite last page.

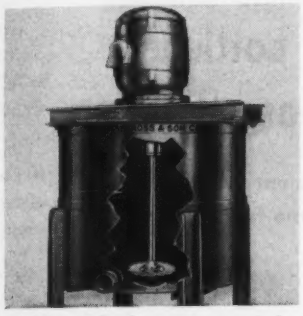
Stationary tank-type dispersers introduced

Can operate at 5000 rpm

Uses: Mixing and dispersing paste-type products in chemical and allied industries.

Features: High-speed dispersers are installed on stationary tanks, either plain or jacketed.

Description: Vessels are available in sizes ranging from 5 to 3000 gal. High-speed impeller is either saw-tooth disc

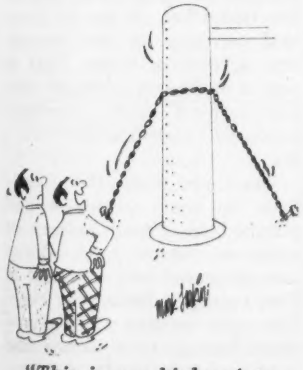


High-speed disperser mounted in stationary tank assures fast mixing in minimum time

type or closed design multiple action mill-head. Impeller and shaft are made of stainless steel and can operate at speeds up to 5000 rpm.

(Stationary tank-type dispersers are product of Charles Ross & Son Company, Inc., 148 Classon Avenue, Brooklyn 5, New York.)

Check 2944 opposite last page.



"This is our high octane unit."

Mark Larkin, Electra Mfg. Co.

CENTRIFUGAL SKILL AT WORK

SHARPLES SUPER CONEJECTOR...

4 Sizes To Meet Every Need

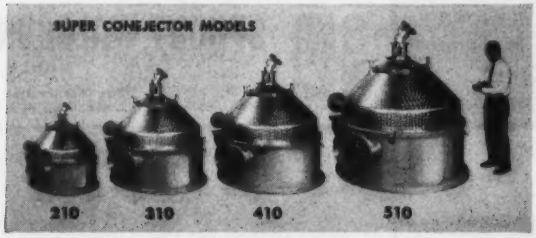
Only with the Sharples Super Conejector do the chemical and food industries have a choice of four sizes for the effective, economical separation of process feeds containing high concentrations of medium-to-coarse crystalline solids, as well as fibrous pulps.

Actually, the four sizes of Super Conejector are today setting the pace for efficient, high production processing. They span the wide industry requirements for production, research and pilot plant operations.

The Sharples Super Conejector applies three continuous dynamic forces — Separating . . . Filtering . . . Metering — to the material being processed. This most efficient application of centrifugal force assures maximum dryness of solids at a minimum consumption of power.

Versatility is built into the Super Conejector with many variables available to meet individual requirements. Processing flexibility is achieved simply by changing these variables and varying the rotational speed.

The Super Conejector is another example of Sharples Centrifugal Skill at Work. Get the full story of this new concept in processing—learn how it can be applied to your special need. Send for your free copy of Bulletin 1288 — "Sharples Super Conejector: Setting The Pace For Efficient, High Production Processing."



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Centrifugal and Process Engineers

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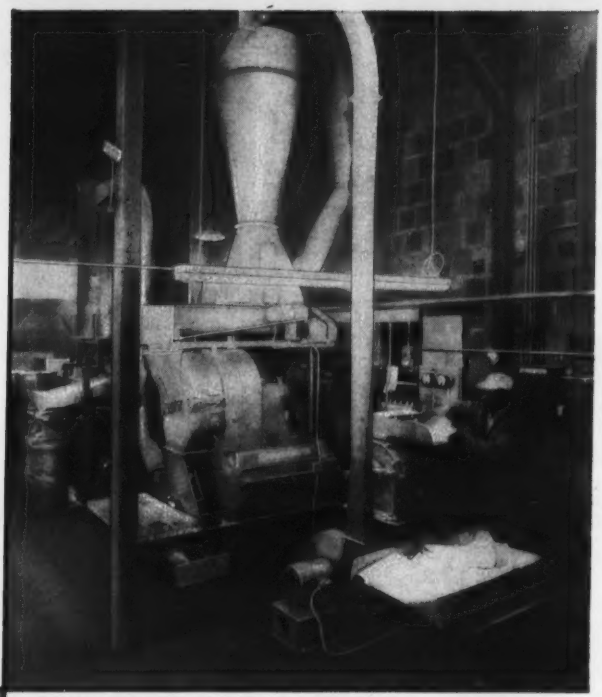
Check 2945 opposite last page.



Installation at Interplastics Corporation, New York City

LOW COST METHOD FOR PELLETING REPROCESSED POLYETHYLENE FILM

Eliminating two major problems in processing polyethylene film scrap has been accomplished with a compact, relatively inexpensive, integrated system which produces agglomerates suitable for use by compounders or molders.

Cutting and shredding the film scrap into suitable size for pelleting is handled on a Sprout-Waldron rotary knife cutter with wide throat hopper for easy hand feeding. A Sprout-Waldron pellet mill is used to produce a considerably different than normal agglomerate —denser than fluffy, chopped film—with better flow characteristics for subsequent extrusion.

Write or phone for an Adaptioneering discussion of your processing problems . . . Sprout-Waldron's experience, technical assistance and cooperative laboratory evaluation are at your service.

cutting processing costs with skilfully engineered single units or complete systems . . . write for bulletins, technical assistance and laboratory evaluation

SW SINCE 1866

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MUNCY, PENNSYLVANIA

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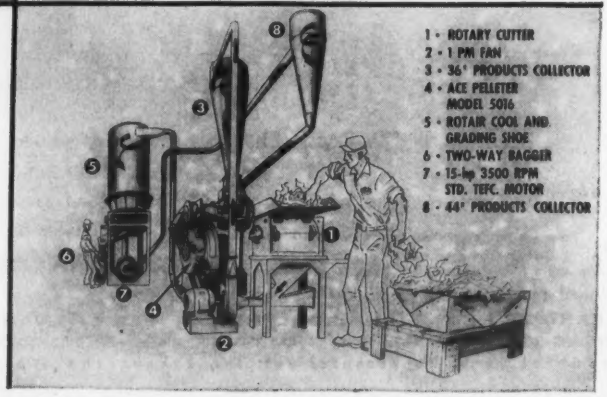
Bulk Materials Handling • Pelleting & Densifying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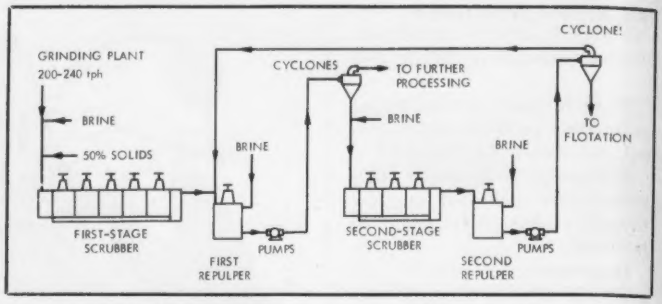
2 - 1 PM FAN
3 - 36" PRODUCTS COLLECTOR
4 - ACE PELLETER MODEL 5016
5 - ROTAIR COOL AND GRADING SHOE
6 - TWO-WAY BAGGER
7 - 15-hp 3500 RPM STD. TEFC. MOTOR
8 - 44" PRODUCTS COLLECTOR

a compact, integrated system for producing agglomerates suitable for use by compounders or molders

607

Check 2946 opposite last page.



Simplified sketch illustrates two-stage scrubbing operations performed on potash ore at Carlsbad, New Mexico, plant

• Whips clay-slime bottleneck
• Improves potash-ore flotation

Ore scrubbing equipment helps isolate, remove troublesome slime fractions at National Potash Company

Problem: Excessive amounts of clay present in their potash ore would have made refining by conventional flotation techniques difficult or impractical at National Potash Company, Carlsbad, New Mexico. The ore contains large portions of water-insolubles — clay slimes being the principal objectional component.

A NEW SOLUTIONS FEATURE

Solution: Because of the abnormal amount of clay, company chose a desliming circuit combining ore scrubbing equipment with cyclones, permitting efficient isolation and removal of the clay slimes from the ore.

Process involves two-stage scrubbing with brine combined with passage through cyclones to separate the sand and slime fractions (see flow diagram). Treated ore is then ready for flotation.

Raw potash ore is first crushed and reduced in size to about 10 mesh. It is then mixed with enough brine to form a pulp containing about 50 percent solids. The slurry serves as feed for the first scrubber.

The machine is a five-compartment unit fitted with turbine-type agitators. Intense scrubbing and mixing action occurs, assuring maximum contact between solids and liquid. Resulting slurry is then sent to a repulper, where more brine is added to make suitable feed for the cyclones.

Initial removal of clay slimes is performed in battery of cyclones. The bulk of the slime solids, including the major part of the dispersed clay, is removed in the overflow of the first-stage cyclones, and processed separately. Bulk of the ore solids is recovered in the underflow of the cyclones and continue to the secondary scrubbing stage. This is also a multi-compartment unit equipped with vertical-mounted, high-intensity mixers.

Discharge from the scrubbers is again repulped and pumped to second battery of cyclones, where more slimes are separated and returned to first repulper. Relatively clay-free ore fraction is removed from bottom of cyclones and sent to flotation cells for further processing and concentration.

Results: The desliming circuit, as illustrated, has satisfactorily performed the function for which it was designed.

The dual-scrubbing steps performed by the machines satisfactorily condition the feed for the subsequent size classification performed in the cyclones so that subsequent flotation steps can be carried out more efficiently. Process permits up to 5000 tons of potash ore per day to be treated in the plant.

(Further information about the scrubbing equipment used in this process may be obtained by checking 2947 opposite last page.)

German centrifuges marketed in U. S. under agreement

The Krupp line of basket centrifuges are now available in the U. S. Exclusive marketing rights have been obtained from German manufacturers by Pfaudler-Permutit Inc.

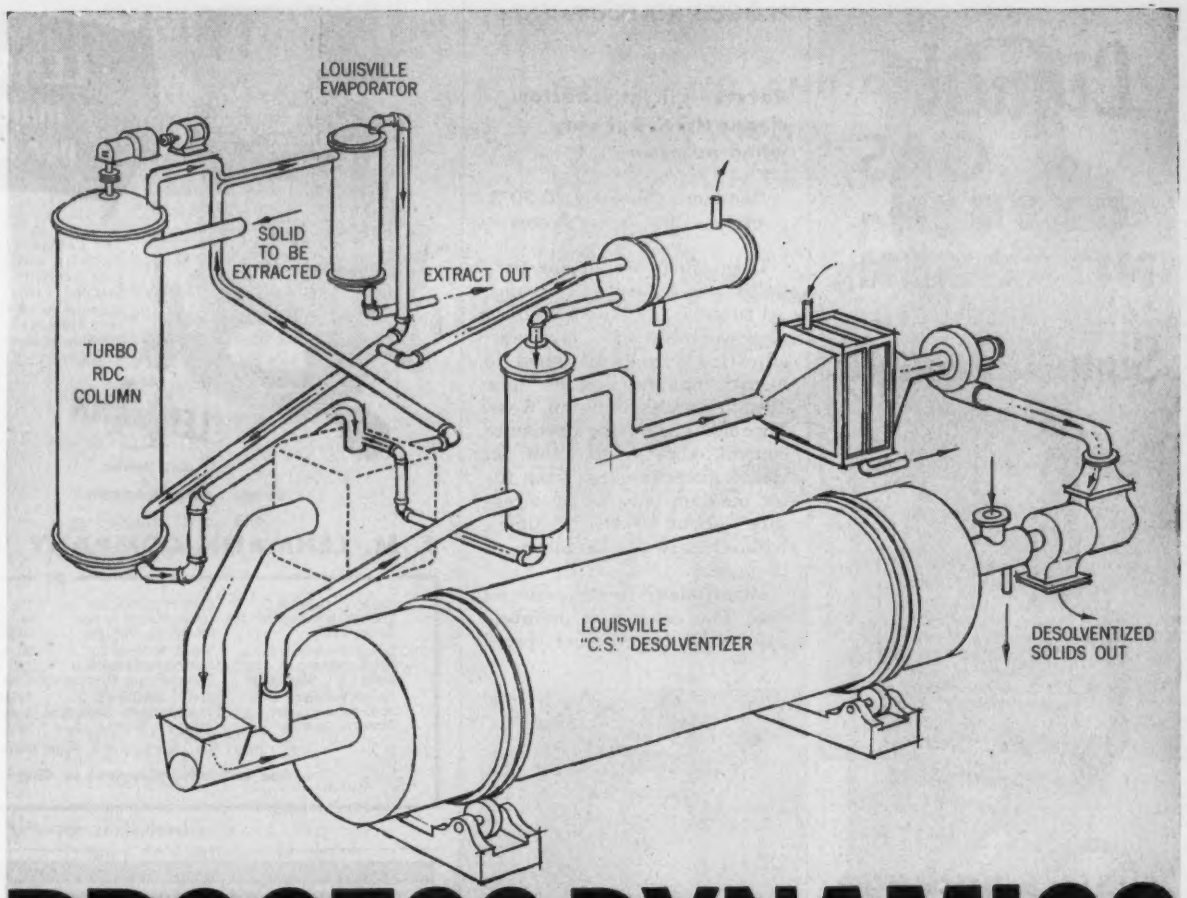
The machines are perforated, basket-type units used primarily for dewatering free-draining materials and crystals. According to the agreement, the units cannot be produced in this country until after 1963.

(Further information about Krupp-Dolberg centrifuges may be obtained from Pfaudler Division, Pfaudler-Permutit Inc., 1000 West Avenue, Rochester 3, New York.)

Check 2948 opposite last page.

NEXT MONTH

Profitable role played by ultrasonic homogenizer in Keyes Fibre Company's switch to continuous pulping process is disclosed in our next issue. The fully automatic unit permits precisely-proportioned, four-component, wax size emulsions — that were formerly tediously made up as 50-gal batches — to be produced at rates up to 1500 gph.



PROCESS·DYNAMICS

A new concept for evaluation and control of **Equipment** and **Process Performance**

General American's wide diversification permits the design of equipment for *controlled performance* and *process in transport.* This diversification plus specialized experience and extensive laboratory facilities assures you of correct equipment construction and maximum utilization of automated systems.

Our engineers, with their broad experience in equipment and process specialties, are ready to work with yours to provide any of the listed equipment and systems, and to install them anywhere in the world.

Unified responsibility as provided by General American means greater efficiency, fewer complaints, improved coordination and far less down-time than you can possibly get when your equipment is furnished by a variety of suppliers.

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GENERAL AMERICAN TRANSPORTATION CORPORATION
135 South LaSalle Street
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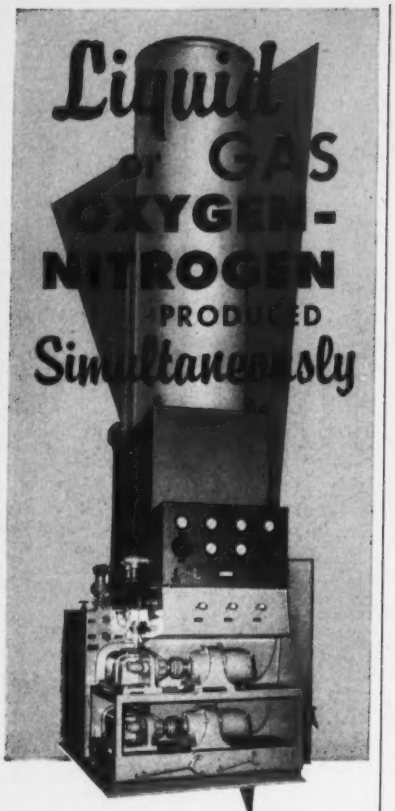
Check 2949 opposite last page.



WITH

IDECO (INDEPENDENT ENGINEERING CO.) **package type**

PLANTS

Now a choice of Liquid or High Pressure Oxygen and Nitrogen Gas, with a minimum time required to reach production temperatures, plus simultaneous production of both gases, which increases production of up to 60% over producing oxygen alone, with a corresponding reduction in operating costs.

The newly designed plants are a combination of the best features of the earlier two-product plants, with the latest concepts of external refrigeration. Type illustrated in sizes from 1500 through 5500 C.F.M. oxygen capacities. Tonnage Oxygen-Nitrogen Plants that produce Argon are also available.

Independent's experienced engineering staff invites the opportunity to assist you in the selection of the proper model and size plant that will fit your individual needs as a user and/or distributor.

SEND YOUR INQUIRIES TODAY TO

INDEPENDENT ENGINEERING CO., INC.

O'FALLON 8, ILLINOIS

Check 2950 opposite last page.

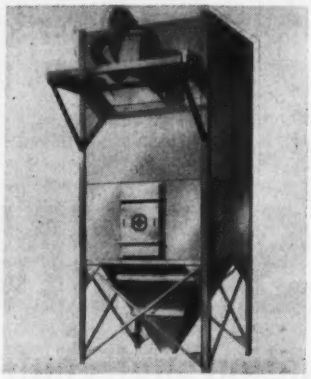
Reverse-air jet collector cleans itself, but only when necessary

Done approximately 20-30% of time unit is on stream

Uses: Removing solid particles from air and gas streams.

Features: Collector's blow ring assembly has "low-rate" adjusting springs designed to insure maximum filter tube cleaning with minimum wear. Through automatic pressure control, high velocity air jet cleans excessive dust from filter medium only when necessary (about 20-30% of time), without need for shutdown or bypassing.

Description: Reverse-air jet dust filter consists of prefabricated, reinforced-steel panel



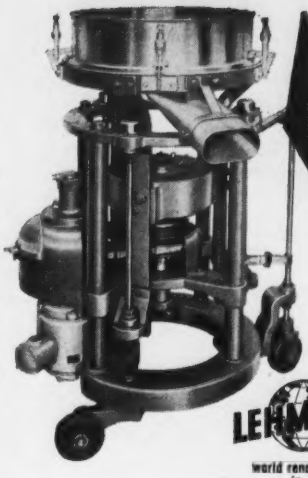
Dust collector has cleaning air provided by centrifugal compressors

housing supported by structural framing members. The blow ring carriage contains 16 self-adjusting assemblies. Each carriage contains two periscope-type connections designed to eliminate excessive flexing of air supply hoses.

Blow ring carriages are driven by four "open-end" chains, each attached to one corner of carriage. Chain arrangement bypasses need for take-up or tensioning devices. Chains never require lubrication.

Carriage drive design also eliminates use of bearings inside filter housing. Only four sealed bearings, externally mounted on housing members are required.

Blow ring carriage assembly



LEHMANN Vorti-Siv
multiplies production per foot of floor space

The Lehmann VORTI-SIV. Compact, versatile, portable. Easily moved on its casters from one location to another as required.

LEHMANN® world renowned in processing machinery

The extraordinary capacity of the VORTI-SIV, which *occupies only 4 square feet of floor space*, enables it to outproduce other types of screening machines occupying many times that amount of space. It MULTIPLIES throughputs because it is the only whirlpool type screening machine with adjustable amplitude and speed. Screens powders, liquids, slurries in 4 to 400 meshes. Practically non-blinding. Meshes quickly changed. Fast clean-up. Write for full information and a free trial run of your product in our plant or contact the Lehmann distributor nearest you.

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Duncan Equipment Co. 506 Broadway Seattle 22, Washington	Geo. R. Mellema Co. 620 Plymouth Building Minneapolis 3, Minnesota	Morton-Myers Co. 220 E. Missouri Avenue Kansas City 6, Missouri	E. C. Swift Co. 3537 Lee Road Cleveland 20, Ohio
Halsell Brokerage Co. 3101 Walnut Street Denver 5, Colorado	Geo. E. Missbach & Co. 3330 Peachtree Road, N.W. Atlanta 5, Georgia	Rawdon Myers Agency Blue Ash Center Bldg. Cincinnati 42, Ohio	Webster Equipment Co. 549 W. Randolph St. Chicago, Illinois

Sada y Himes S.A., Apartado 911, Padre Mier 1250 Pte., Monterrey, N.L., Mexico

See our advertisement in Chemical Engineering Catalog

Check 2951 opposite last page.

USING SCREEN SEPARATIONS? NOTHING CLASSIFIES AS PERFECTLY AS AIR

GAYCO
CENTRIFUGAL AIR SEPARATORS

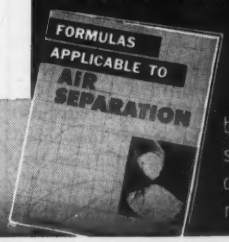
Classify practically all dry fine materials

You get:

- CLOSER SEPARATIONS
- IMPROVED PRODUCTION
- NO UNDESIRABLE OVERSIZE.

RANGE 60 to 400 mesh. Timken bearings. Choice of Standard or Heavy Duty Models.

Backed by over 40 years experience



this helpful booklet sent on request

Robert M. Gay Division

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*"Substantial operations" does not necessarily mean an extremely large plant. But requests for the magazine exceed supply so we must set standards to insure publication being sent where it can be used to best advantage.

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Main Products

is belt-driven by fractional horsepower motor. Centrifugal compressors provide pressurized reverse-jet air supply. Totally-enclosed motors are used throughout. The felt filter medium used is reported to be virtually 100% efficient.

(Model-K Aeroturn dust filter is product of Metal Products Division of Koppers Company, Inc., 200 Scott Street, Baltimore, Maryland.)

Check 2953 opposite last page.

Compact gas plants produce 98% H_2 from ammonia

Uses: Producing relatively pure hydrogen at rates up to 10,000 cfh.

Features: Plants turn out hydrogen having 82-98% purity, balance being nitrogen. Purity is completely controllable.

Description: Compact plant consists of two stages. First dissociates hydrogen and nitrogen in commercial anhydrous ammonia. Second stage uses continuous cycling adsorption process to separate hydrogen from the nitrogen gas.

Process uses either liquid or gaseous ammonia, which can be purchased and stored in bulk form. Gas or oil fuel, electrical power and small quantities of cooling water are also required. If necessary, equipment can be altered to operate only on ammonia, electrical power and water.

System starts up quickly. It operates in any range from 25% to full capacity. Cost per cu ft of hydrogen produced is reported to be relatively low, as is initial investment.

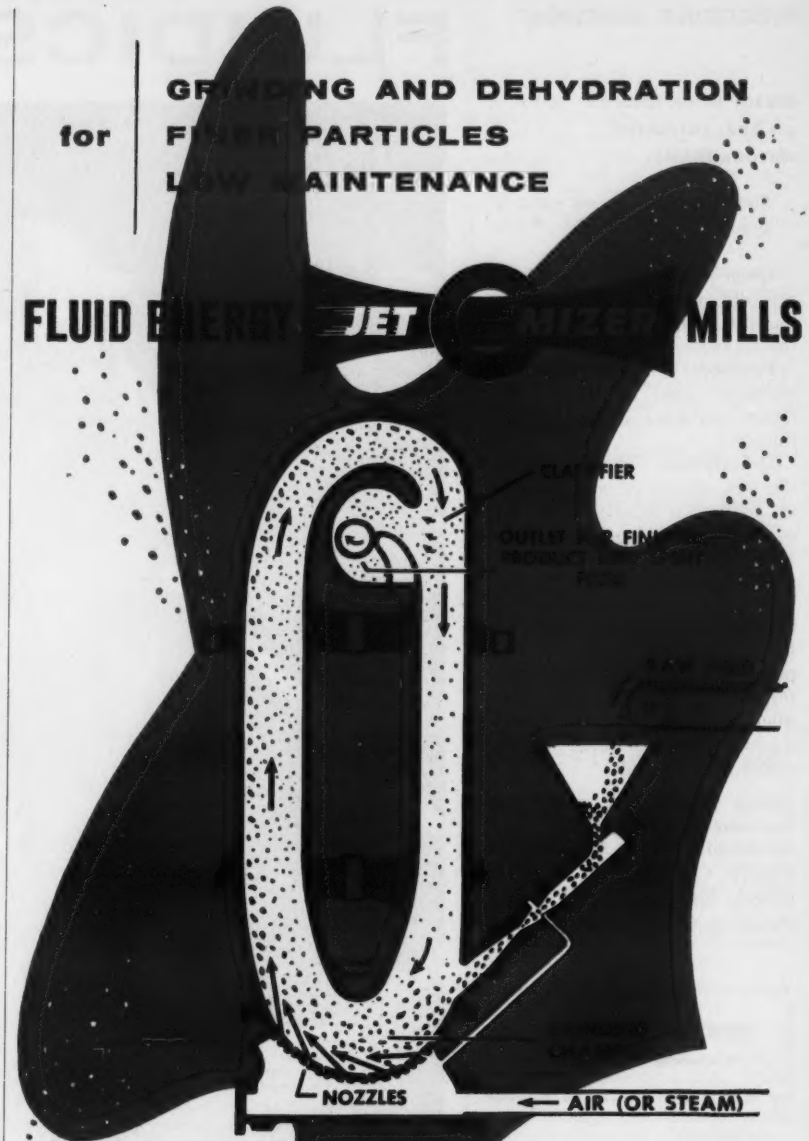
Plants are very compact. For example, a 750 cfh unit complete with auxiliary equipment, occupies 6 x 12 x 10'-high space. Plant is shipped completely assembled, requiring only connection to ammonia storage and utilities.

(Further information about packaged hydrogen plants may be obtained from The Electric Furnace Co., 600 W. Wilson Street, Salem, Ohio.)

Check 2954 opposite last page.

for GR[illegible]NG AND DEHYDRATION F[illegible]PARTICLES L[illegible]AINTENANCE

FLUID E[illegible]JET [illegible]MILLS



The Fluid Energy "Jet-O[illegible]" [illegible]igned and built by the pioneers in fluid energy fine grind[illegible] [illegible]ore than produce fine particles. It controls fineness and prod[illegible]ality with a narrow distribution range and simultaneously with grinding can dehydrate, coat particles, blend and achieve chemical changes.

Jet-O-Mizer Mills are being used all over the world, processing many types of materials in the following industries:

• Abrasive	• Food	• Pigment	• Wax
• Insecticide	• Mineral	• Plastic	• Metal
• Ceramic	• Pharmaceutical	• Carbon	• Chemical

"Jet-O-Mizing" produces **FINE PARTICLES** ¼ micron average and above **PLUS . . .** Narrow Particle Distribution • Dry, or Controlled Moisture Content • Continuous Operation • Uniformity of End Product • Other Operations with Grinding • No Attritional Heat — No Moving Parts • Low Operating Costs • Low Maintenance

Send for complete information on Fluid Energy's "Jet-O-Mizer" Mills, "Jet-O-Clone" Dust Collectors, and TESTING AND CUSTOM GRINDING services.

FLUID ENERGY PROCESSING & EQUIPMENT COMPANY

Richmond & Norris Streets, Philadelphia 25, Pa. • Phone: Regent 9-7728

(Formerly known as the Wheeler-Stephanoff Mill)

Check 2955 opposite last page.

Metal filter thrives on hot, corrosive viscous fluids

Sintered element can remove 2-micron particles

Uses: Filtering liquids which are difficult or impossible to handle with conventional filter media.

Features: Sintered, type-316, stainless steel filter can remove particles down to two microns.

Description: Filter can handle hot, corrosive, viscous fluids without difficulty. Units are available with particle-retention ratings of 40, 20, 10, 5 and 2 microns.

Porosity is high. Large percentage of voids provides large dirt-hold capacity and permits rapid flow with thick liquids. Cleaning may be conducted either by firing, backflushing and chemical or ultrasonic treatment.

(More information about porous metal filter element may be obtained from Commercial Filters Corporation, 2 Main Street, Melrose 76, Mass.)

Check 2956 opposite last page.

NEW LITERATURE
Processing Equipment

Filters, thickeners, clarifiers and other chemical processing equipment are reviewed in 18-page booklet. Manufacturer's facilities are also depicted. "Quality Products from Eimco" — The Eimco Corporation.

Check 2957 opposite last page.

Ceiling-suspended sifters for separating and classifying dry materials are discussed in four-page bulletin. Design information and specifications are included. Super Sifter Bul — Sprout, Waldron & Co., Inc.

Check 2958 opposite last page.

Mixers, mills, blenders, screens and other equipment for chemical and fine ceramics production are detailed in eight-page bulletin. Bul 300 — International Process Equipment Company, Division, The Patterson Foundry and Machine Company.

Check 2959 opposite last page.

FLUIDICS* AT WORK

At Jefferson Chemical Company, Inc., Austin, Texas, a 12" I.D. Pfaudler Wiped Film Evaporator distills heat-sensitive organics at an overhead rate of 500 lbs. per hr.

HEAT-SENSITIVE ORGANICS NO PROBLEM with this Wiped Film Evaporator

Jefferson Chemical distills heat-sensitive, high-boiling organics in it with yields of 42 lbs. per hr. per sq. ft. of heat transfer area.

They operate their Pfaudler® Wiped Film Evaporator at 2mm Hg and report unit is simple to clean and maintain. "Actually the over-all performance of this evaporator is superior to any expectations we had," states Jefferson Chemical.

Mechanical wiping. A *true* wiped-surface evaporator, it uses centrifugal force to hold four free-floating wipers in contact with the internal heated wall. Slots in the wipers *prevent* curl and spread product in a thin, uniform film to assure full use of heat transfer area.

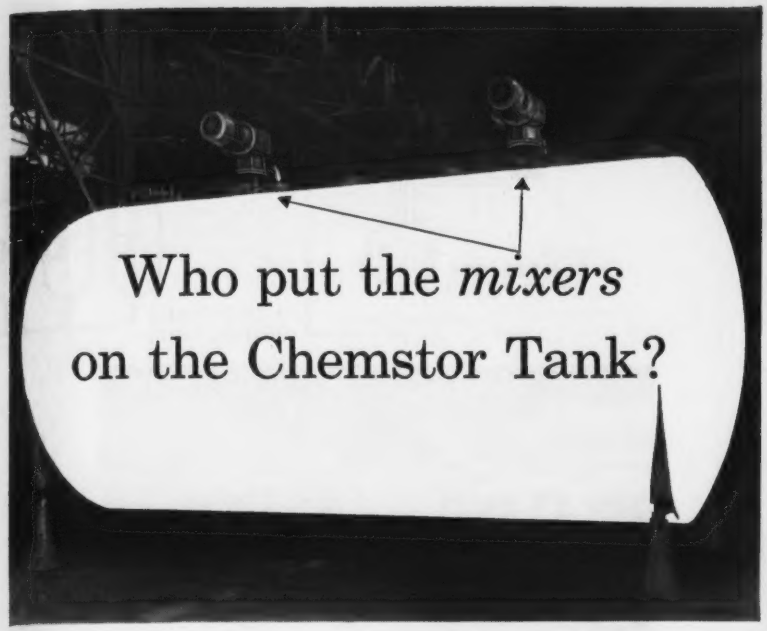
This construction also makes the Pfaudler unit well suited to handling products that are highly viscous or low in thermal conductivity.

Internal condenser. The "U"-tube bundle is *inside*, so there's a negligible pressure drop between evaporating and condensing surfaces. With an internal condenser, you also need less floor space and save on ductwork, piping and installation costs.

Functional simplicity. There's no bottom bearing in any Pfaudler evaporator, so you don't worry about trouble or maintenance. With some products you clean by running a solvent through. For visual inspection or more thorough cleaning, just break vacuum and lift drive, top head, and rotor out as a single unit.

Choose from 12" I. D. models (4, 9 or 12 sq. ft. of evaporating area) or 36" I. D. models (30, 50, 75 and 100 sq. ft.). If you need larger sizes, we make them on a custom basis.

Test the performance of *your product* in the Wiped Film Evaporator at the Pfaudler Test Center. Or get more details from Bulletin 991. Write to the address shown on the facing page.



We did. Which should interest you if anything you store tends to *separate out* on standing.

Agitation as an integral part of Pfaudler Chemstor Tanks should prove particularly attractive if the products you handle are *corrosive*, since the tanks are of Glasteel—glass inside, steel outside—and resist attack from all acids (except HF) and most alkalies.

Initially, you will be able to get 32" or 36" turbines installed in 5-, 10-, or 15-thousand-gallon tanks operating at 55 rpm with our 4TW drive.

Chemstor Tanks are an excellent investment for two reasons. With any corrosive, unusually *long service life* is the payoff. And in sizes from 10- to 35,000-gallons, regardless of what you store, savings are immediate, since the *costs are lower* than for stainless.

Glasteel is hard, nonporous and smooth, so there's little chance for build-up, even with sticky substances. And the inert glass product-contact surface protects against contamination.

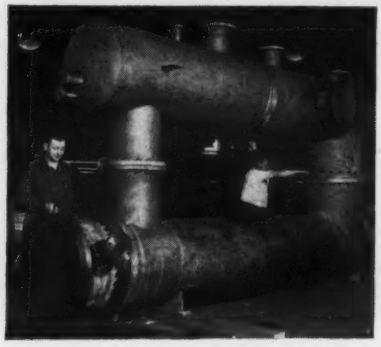
Your questions on applications, availability and other uses for Chemstor Tanks, complete with agitation, will be answered promptly. Send your questions to the address at the bottom of this page.

When your heat exchanger needs are very "special"...

Bring them to us. We may respond with an all-stainless unit like this one. It is an 840-square-ft. shell-and-tube exchanger with 30-inch-diameter shell, 16-feet long, for operation at 650°F, 75 psi. Tubes are made of type 316, and the shell is E.L.C., grade 304.

Or we might recommend components of titanium, zirconium, tantalum, Glasteel, nickel, Inconel, Monel, Hastelloy, or impervious graphite.

Since we fabricate, and are equally at home with the performance characteristics of all of these materials, you get the obvious benefit of an impartial design proposal. Often the answer to your special problems will be a *combination of* materials.



The intent is always to provide the optimum design in terms of heat transfer efficiency and corrosion resistance, at the *lowest* cost.

Tell us your problem. Or ask for Bulletin 949.

Please address all inquiries to our Pfaudler Division, Dept. CP-31, Rochester 3, N. Y.

*FLUIDICS is the Pfaudler Permutit program that integrates knowledge, equipment and experience in solving problems involving fluids.

NEW BULLETIN—Glasteel, the Material of Construction

Just off the press is our four-color Bulletin 985, documenting the characteristics of Glasteel 59.

Of its 20 pages, 16 are devoted to *technical data* on specifications, thermal shock, operating temperatures, heat transfer, alkali resistance, acid resistance, and corrosion evaluation facilities.

This is the first time all pertinent data on Glasteel have been brought together in a single brochure. The results are impressive. Quite possibly this bulletin will suggest ways in which you can put this material of construction to use—reducing costs, improving service life of equipment, protecting product purity.

We think you'll find Bulletin 985 a worthwhile addition to your file. Write for your FREE copy.

PFAUDLER PERMUTIT INC.

Specialists in FLUIDICS . . . the science of fluid processes

Check 2960 opposite last page.

PROCESSING EQUIPMENT

Spraying drying advantages are listed in four-page brochure. Equipment and atomization techniques used in various installations are discussed. Bul 51 — Bowen Engineering Inc.

Check 2961 opposite last page.

Fluid-bed phthalic anhydride process, including flowsheet and plant photographs, is reviewed in four-page brochure. Temperature control, potential yield, product purity, air requirements and operating and maintenance costs are discussed. Bul "Phthalic Goes Fluid Bed" — Badger Manufacturing Company.

Check 2962 opposite last page.

Processing and material handling equipment is topic of four-page catalog. Over 20 photographs are provided. Bul 102 — The Young Machinery Company, Inc.

Check 2963 opposite last page.

Revised specifications for testing sieves are listed in eight-page bulletin. Proposed international standards are included. Bul 608 — The W. S. Tyler Company.

Check 2964 opposite last page.

Basic factors to consider in the economic evaluation of heat exchangers and other capital equipment are discussed in 16-page booklet. Series of charts illustrate cost per sq ft of various type of heat exchangers. "Cost Engineering" — Western Supply Company, Heat Exchanger Division.

Check 2965 opposite last page.

Self-cleaning filters are topic of 16-page catalog. Cut-away view illustrates cleaning action. Filter selector chart and flow tables are also included. Cat 51-100 — The Cuno Engineering Corporation.

Check 2966 opposite last page.

More than 75 photos highlight 16-page bulletin reviewing dryers, calciners, kilns, and 13 other kinds of processing equipment. Manufacturer's pilot plant and research facilities are also described. Bul G560—Edw. Renneburg & Sons Co.

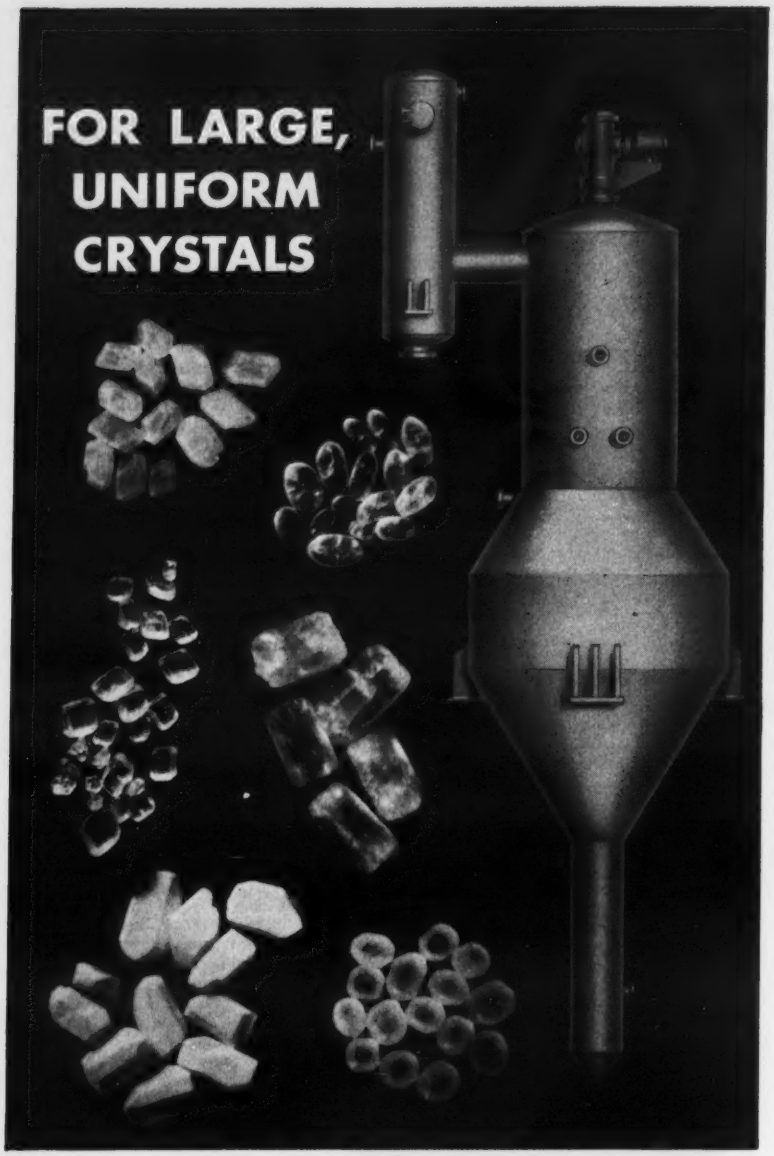
Check 2967 opposite last page.

Installation and maintenance of double-pipe heat exchangers is discussed in eight-page manual. Tips on cleaning are presented. Bul 120 — Brown Fintube Company.

Check 2968 opposite last page.

Definitions of terms most frequently used in the specification of industrial wire cloth are listed in new bulletin. Bul 115 — The Cambridge Wire Cloth Company.

Check 2969 opposite last page.



Swenson's new Draft Tube Baffle Crystallizer is the most advanced equipment yet designed for production of large, uniform crystals required in fertilizers and similar materials. Low first cost and long operating cycles, plus unusually simple control of operation, offer high product quality at significant production economies.

Bulletin SW-206, *Draft Tube Baffle Crystallizers,* describes operation in full detail. Write for it today: Swenson Evaporator Company, 15667 Lathrop Ave., Harvey, Illinois. In Canada: Whiting Corporation (Canada) Ltd., 350 Alexander Street, Welland, Ontario, Canada.

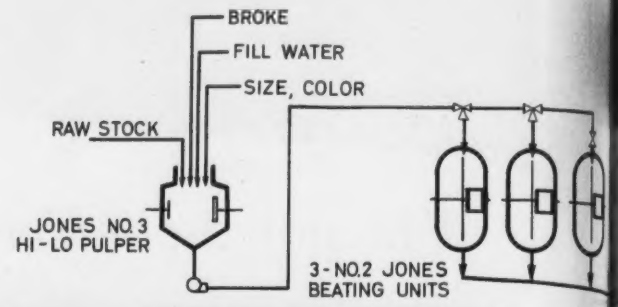
PROVED ENGINEERING FOR THE PROCESS INDUSTRIES SINCE 1889

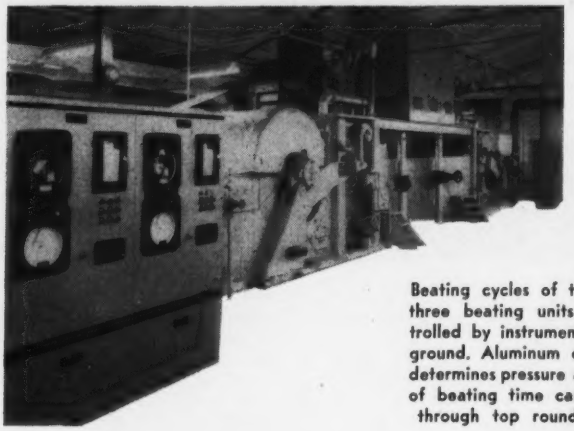
SWENSON

A Division of WHITING Corporation

WHITING — MANUFACTURERS OF CRANES; TRANBEAM® HANDLING SYSTEMS; PRESSUREGRIP; TRACKMOBILES,® FOUNDRY, AND RAILROAD EQUIPMENT

Check 2970 opposite last page.





Beating cycles of two of the three beating units are controlled by instruments in foreground. Aluminum cam which determines pressure and length of beating time can be seen through top round window

Three-phase system whips glassine refining problems

THIRTY-THREE YEARS of experience with difficult-to-manufacture glassine and greaseproof papers are distilled into Nicolet Paper Corporation's recently-expanded facilities at West De Pere, Wis.

A NEW SOLUTIONS FEATURE

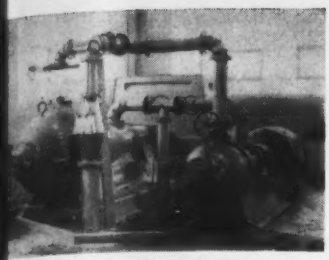
While the expansion is expected to boost Nicolet from fourth to third place among U.S. glassine producers, of particular interest is this veteran papermaker's approach to some of the knotty problems inherent to the manufacture of these specialty papers.

Nicolet engineers resorted to a three-phase system (pulping, beating and refining) to accomplish the extensive fibrillation of fibers vital in preparing pulp for glassines.

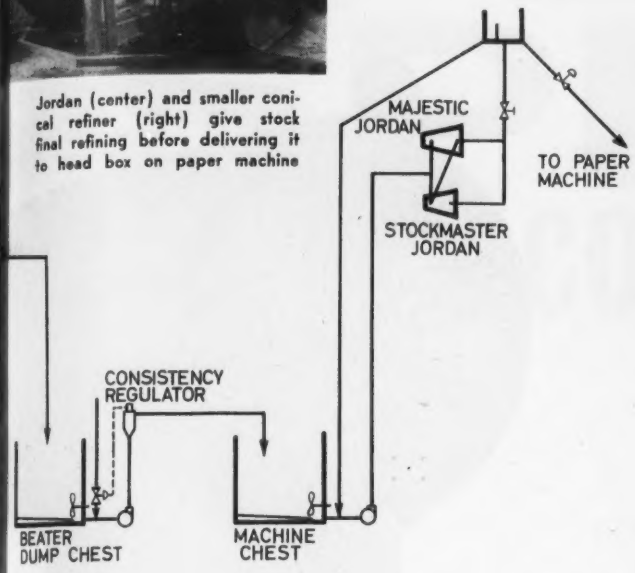
Two high-low-speed pulpers were adopted for the job of 1) coping with broke (waste pulp and damaged paper) which is difficult to break down because of special surface materials used in treating glassines; and 2) disintegrating the pulp into the heavy consistency stock most suitable for beating.

Each has a 2500-lb-capacity (at 7½% consistency, dry weight) stainless-steel tank and two rotors — low-speed, driven by 100-hp motor for initial disintegration and blending; and high-speed rotor, driven by 125-hp motor, for complete defibering through violent agitation.

The pulpers are installed with inlet openings level to the operating floor. Stock is



Jordan (center) and smaller conical refiner (right) give stock final refining before delivering it to head box on paper machine



Pulpers, beaters, refiners teamed up to accomplish extensive fibrillation required of stock for these difficult specialty papers

prepared in two cycles for beating.

First, broke and chemical additives are agitated for 10-15 min by the low-speed rotor; then pulp is added and the cover closed for approximately 30 min of high-speed defiberization.

Nicolet uses bleached and unbleached 100% sulfite as well as bleached and semi-bleached 100% kraft pulps which are received by freight car in dry form (50-100% "air dry").

The resulting stock can be pumped to the beaters in up to the 7% consistency considered ideal. In addition, there has been no trouble reported with broke "specks" on the 160" papermaking machine.

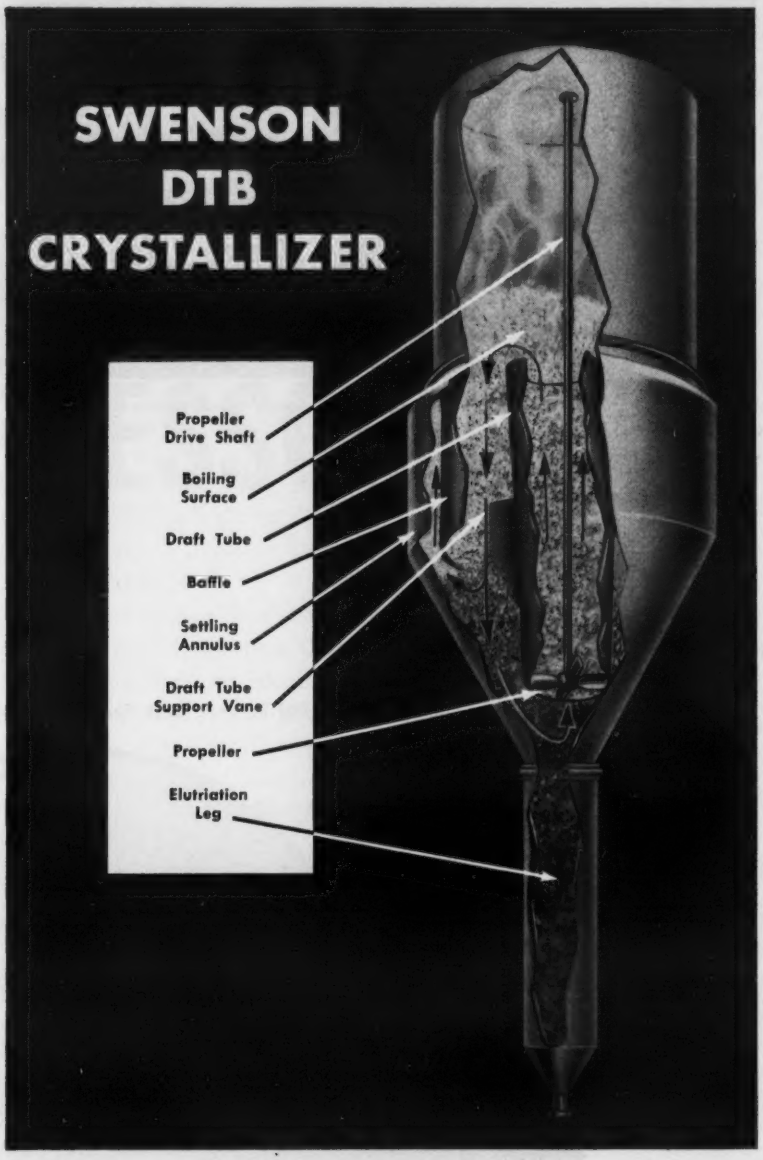
From the pulpers, stock flows by gravity through a 20" pipe to a bronze-fitted pump where the pipe narrows to 17" at the intake point. Then, it is pumped through an 8" pipe to the beater room, about 120' away. All pipe is stainless steel.

Lava Beater Tackle

Stock for the manufacture of glassine and greaseproof paper must be submitted to maximum beating in order to obtain the extensive fibrillation desired — but fiber cutting must be held to a minimum to retain strength.

For this reason, the three beating units used at Nicolet employ lava, rather than metal, tackle. Lava combines the

To page 88



BASIC PRINCIPLES OF THE DRAFT TUBE BAFFLE CRYSTALLIZER

• Growing crystals are brought to boiling surface where super-saturation is most intense and growth most rapid • Sufficient seed surface is maintained at boiling surface to minimize harmful salt deposits on equipment surfaces • Low head losses in internal circulation paths permit large flows at low power requirements • Optimum fines removal is possible because of high flow-rate past separation zone

Swenson designs three types of DTB Crystallizers — Cooling, Evaporative and Reaction. To determine the one best suited to *your* needs, write to: Swenson Evaporator Company, 15667 Lathrop Ave., Harvey, Illinois. In Canada: Whiting Corporation (Canada) Ltd., 350 Alexander Street, Welland, Ontario, Canada.

PROVED ENGINEERING FOR THE PROCESS INDUSTRIES SINCE 1889

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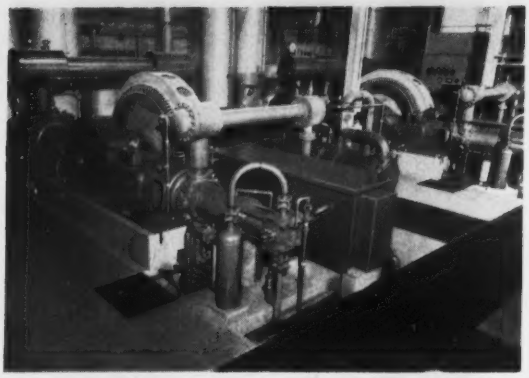
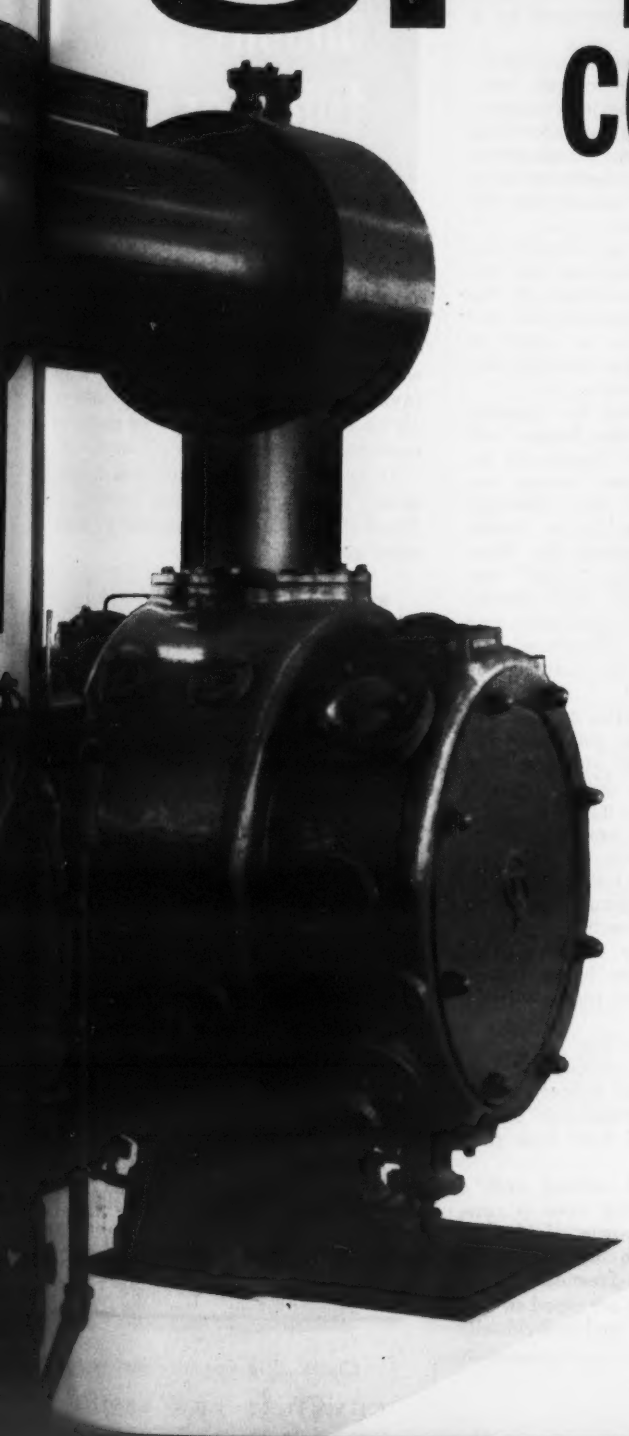
HORIZONTAL



Class H-CE, 4-corner, 5-stage compressor
operating at 3,000 psig

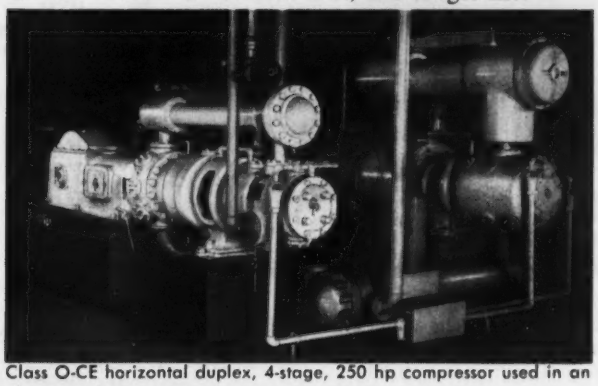
A battery of these 800 hp Class O-CE Compressors serve a large steel mill



LOW SPEED COMPRESSORS

Chicago Pneumatic offers a wide variety of designs of compressors in sizes up to 5,000 horsepower and for pressures up to 15,000 psig.

Horizontal machines such as the Class O Duplex and the Class H Horizontal Four-corner Compressor are preferred for many applications because of their low speeds, greater accessibility, greater flexibility of cylinder arrangements for many multi-stage installations, and for lower maintenance cost, and longer life.



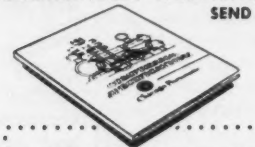
Class O-CE horizontal duplex, 4-stage, 250 hp compressor used in an air separation process

Chicago Pneumatic

AIR AND GAS COMPRESSORS • VACUUM PUMPS • PNEUMATIC AND ELECTRIC TOOLS • DIESEL ENGINES • ROCK DRILLS • HYDRAULIC TOOLS

SEND THIS COUPON . . . Get Your Free Copy of "Compressor Specifications" Now!

Includes 14 pages of compressor engineering data, plus 2 special reports on reciprocating compressors.



Chicago Pneumatic Tool Company CP-11
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Please send FREE copy of "Compressor Specifications" to:

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Company_____

Address_____

City_____ Zone_____ State_____

For more information on product at left, specify 2972 see information request blank opposite last page.

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. . . they offer better fit, greater dexterity, more comfort, longer wear, and superior safety in handling acids, alkalis, oils and greases, solvents and many other chemicals.

To keep outdoor workers dry, comfortable and safe in foul weather, insist on high-visibility yellow North PVC Clothing . . . resistant to oils, greases and chemicals, tough. flexible, nonaging and waterproof.

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"Jomac Sells Quality . . . and Quality Sells Jomac!"

Check 2973 opposite last page.

Glassine Refining

From page 85

ultimate in hydration with a minimum of cutting.

The beating units are equipped with glazed-tile, 2500-lb-capacity tub, basalt lava rolls and triple basalt lava bedplates, covering an arc of 75° of roll circumference. Each is powdered by a 300-hp motor.

Beating cycles are automatically controlled for roll loading by cam-type instrumentation. Cams are cut according to various paper specifications and determine both pressure and length of beating time for desired freeness.

Cycles average 75 to 90 min, but occasionally may be extended to two hours if the quality and type of pulp require. Freeness of stock is tested about five minutes before end of cycle.

When beating for glassine quality, a single beater will treat up to 16 tons in 24 hr.

Hand-operated valves release the stock into a 5000-lb-capacity glazed-tile beater chest which serves the three beaters. Dilution "white" water is used to "flush-down," reducing final consistency to a 3½-4% range. Horizontal agitators keep the material in suspension.

From the beater dump chest, the stock is pumped 600′ through an 8″ stainless-steel pipe to the 500-lb-capacity circular, tile machine chest housed in the new building.

Passing from the machine chest, through mechanical consistency regulators, stock is pumped 19′ vertically to the main machine floor for final refining before being routed into the paper machine head box.

"Slower" or low production grades are worked in the smaller conical refiner, with a connected horsepower of 150 and equipped with lava plug and shell.

The second refining unit, a jordan, drawing upon a connected horsepower of 400 and equipped with bronze bars, is used for high-freeness grades.

These units are piped so that they can be used individually

To page 90

Can you use a unique, processed carrier... diluent... filler or absorbent

Whether you need a carrier for concentrates, or a diluent for adjusting bulk density or absorbent for liquids (atomic wastes), you'll find Pikes Peak Clay (available in Mesh sizes from −325 to ½″) has an exceptionally low moisture content and remarkable pH of 5.

It is highly absorbent, less hygroscopic and has unmatched flowability. Pikes Peak Clay is currently being used as:

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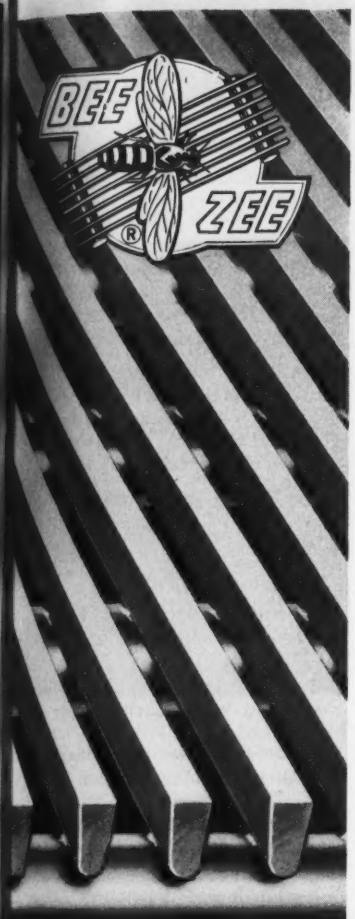
Try the unique properties of Pikes Peak Clay. It can solve a practical production problem in your plant. Write today for samples and technical data, or call GRaceland 7-3071 to discuss your problem personally.

GRC GENERAL REDUCTION COMPANY
CHICAGO 6, ILLINOIS

Check 2974 opposite last page.



SCREENS THAT TURN PROBLEMS INTO PROFIT

■ Tough jobs call for tough screens . . . screens that have been carefully, intelligently engineered. By making tough jobs look easy, Bee-Zee Screens make you money. They're all-stainless-steel and *all-welded*, with rods spaced precisely by electronic control. The equipment you own and operate right now can be equipped with Bee-Zee Screens —as shown above or in any of the rod shapes shown below. Wire, write or phone Galesburg DIckens 2-5154 collect.

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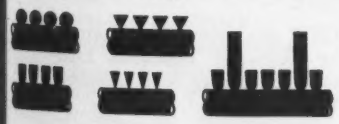
Bee-Zee Screens in a wide variety of shapes and sizes meet the needs of leading firms in the coal, minerals, quarry, oil, food, chemical, plastic, brewing, distilling, pulp and paper, rubber and other industries.



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CUT HERE AND FILE

processing and engineering data

Construction of Curved Scales on Line Coordinate Charts

D. S. DAVIS
University of Alabama

In graduating graphically determined curved axes on line coordinate charts, one must employ methods of interpolation to avoid serious errors in scaling. Consider Fig. 1 (p. 91) a portion of a line coordinate chart for rapid estimation of viscosities of aqueous solutions of calcium chloride. Brief study of the underlying data of Table I (below) reveals the relationship:

$$\log (\mu - 0.004\mu^2) = a + b\,t$$

where: μ = viscosity, centipoises
t = temperature, °C
and a and b depend upon the concentration of solute.

Inaccurate Method

Points on the concentration axis for percentages of solute of 11, 16, 20, 22.8 and 25.2 are determined by connecting corresponding values on the parallel temperature and viscosity scales with straight lines. To determine the concentration axis, it would usually suffice to connect the points so found with a smooth curve, avoiding unnecessary bends and points of inflection. Such a curve, Fig. 1, is shown plotted for weight percentages of $CaCl_2$ below 20.

A careful plot would then be made of distances of points for 16, 20, 22.8, and 25.2% from the 11% point. Distances for intermediate graduations of 12, 14 and 18% would then be read from the plot and marked off along the curved concentration axis. Two of these graduations, however, would be seriously in error.

Recommended Method

A better method for locating the graduations for 12 and 14% consists of plotting viscosities at 0 and −5°C vs concentration as shown in the upper portion of Fig. 2 (p. 93), reading viscosities for 12 and 14% from the curves, and locating the desired points by connecting corresponding values with straight lines as shown by the broken index lines in Fig. 1. The graduation for 18% is determined from the plots for 0 and −10°C in Fig. 2. A better portion of the concentration axis for values below 20% is then drawn by connecting the points so found with a smooth curve to form the solid axis.

Comparison of Methods

Table II lists viscosities at 0°C read from the dotted and solid portions of the concentration scale and viscosities computed by means of the eminently reliable Lagrange interpolation formula. Note that graduations determined by the recommended method result in viscosities that agree exactly with those found by means of Lagrange interpolation and that the other graduations (on the dotted scale) do not.

Table I

Wt % $CaCl_2$	Viscosities of Aqueous $CaCl_2$ Solutions, cp					
	0°	−5°	−10°	−15°	−20°	−25°C
11	2.1	2.4				
16	2.6	2.9	3.3			
20	3.1	3.5	4.0	4.5		
22.8	3.6	4.1	4.6	5.2	5.9	
25.2	4.0	4.6	5.1	5.8	6.6	7.4

Table II

	Viscosities of aqueous $CaCl_2$ solutions at 0° C, cp	
	12	14% $CaCl_2$
Inaccurate method, dotted scale, Fig. 1	2.16	2.35
Recommended method, dotted scale, Fig. 1	2.20	2.40
Lagrange interpolation	2.20	2.40

nomographs on pages 91 and 93

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BARTLETT-SNOW
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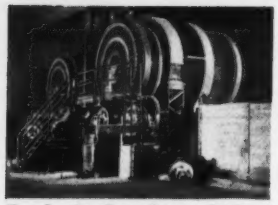
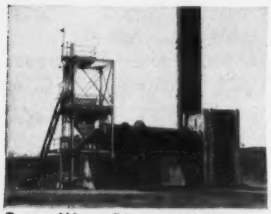
ROTARY KILNS



Two Bartlett-Snow Rotary Oil-Fired Batch Kilns Pre-heating Charges for Electric Furnaces.



Rotary Waste Disposal Kiln Showing Skip Loader and Brick Ash Collection Chamber.

Proven design and construction for processing a wide variety of materials—pre-heating—and waste disposal

Bartlett-Snow continuous kilns are ideally suited for calcining ores, petroleum coke, and crystalline chemical salts; nodulizing ores, applying ceramic coatings to granulated materials and performing a wide variety of other oxidizing and mildly reducing operations. Temperatures from 1000°F. to 2900°F.

Rotary batch kilns are used for batch heating and drying, also pre-heating charges for electric furnaces. They bring the furnace charge up to temperature with inexpensive gas or oil fuel, shortening the furnace cycle. Waste disposal kilns provide an efficient, economical method of disposing of combustible sludges and other industrial wastes.

Complete laboratory facilities to help you improve your old, or develop new techniques and processes. Let us work with you on your next job!

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Bulletin No. 118 gives full details. Send for a copy Today.

Check 2976 opposite last page.

Glassine Refining

From page 88

or in parallel. They also could be piped for use in series.

When stock reaches the head box, consistency has been reduced, on an average, from the original 7% at the pulpers down to 0.3%.

(Hi-Lo Pulpers, beating units, Majestic jordan and Fibre master conical refiner for stock preparation system were manufactured by E. D. Jones Corporation, Pittsfield, Mass.)

Check 2977 opposite last page.

Easy-to-operate device determines mw of unknown materials

Syringe assembly eliminates opening after each sample

Uses: Accurate determination of molecular weights of unknown materials in solution.

Features: Syringe assembly eliminates need to open device after each sample. Simply-operated device is accurate to within 1 to 2%.

Description: Instrument consists of a thermostated chamber wherein the atmosphere is saturated with the vapor of a solvent. Probe composed of two bead thermistors is enclosed. Drops of solvent and of sample solution are applied to beads through one of six syringe assemblies.

Since at any given temperature the vapor pressure of a solution is lower than that of the solvent, solution drop warms up (by condensation of minute amounts of solvent) until pressure balance between the two drops is attained.

This temperature rise, is about proportional to the "osmotic concentration" of the sample solution. When the instrument is calibrated with solutions of known concentration, the MW of the unknown solution can be calculated.

(MW analyzer was developed by Stanford Research Institute for Mechrolab, Mountain View, Calif.)

Check 2978 opposite last page.

Size Requirements Getting Tougher?

Sturtevant Air Separators increase 40 to 400 Mesh Output as Much as 300%

Closed-circuit air separation is of proved advantage in reduction processes. Result is a better, more uniform product. Grinding mills perform at top efficiency, output frequently increases as much as 300%, power costs drop as much as 50%.

Precise separation of all dry powdered materials. Sturtevants currently classify sulfur, soybeans, phosphate, chocolate, feldspar, sand and aggregates, pigments, limestone fillers, flour, abrasives, plastics, gypsum, ceramics, cement and other products.

Improve screening — Sturtevant Air Separators prevent blinding by removing undesirable tailings *or* fines from screen feed loads.

Works Like Winnowing Done in a Whirlwind

Sturtevant Air Separators do a mechanical job of winnowing. Precise control of whirlwind air currents and centrifugal force results in the desired size being lifted into fines cone, oversize falling into tailings cone.

A 16 ft. Sturtevant, for example, has taken a feed rate of 800 tph, containing only a *small* percentage of desired fines, and delivered 30 tph 90% 200 mesh, recirculating the oversize through the grinding circuit.

Send for Bulletin No. 087.

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MILL COMPANY
119 Clayton St., Boston, Mass.
Crushers • Grinders • Micron-Grinders • Separators
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Construction of Curved Scales on Line Coordinate Charts

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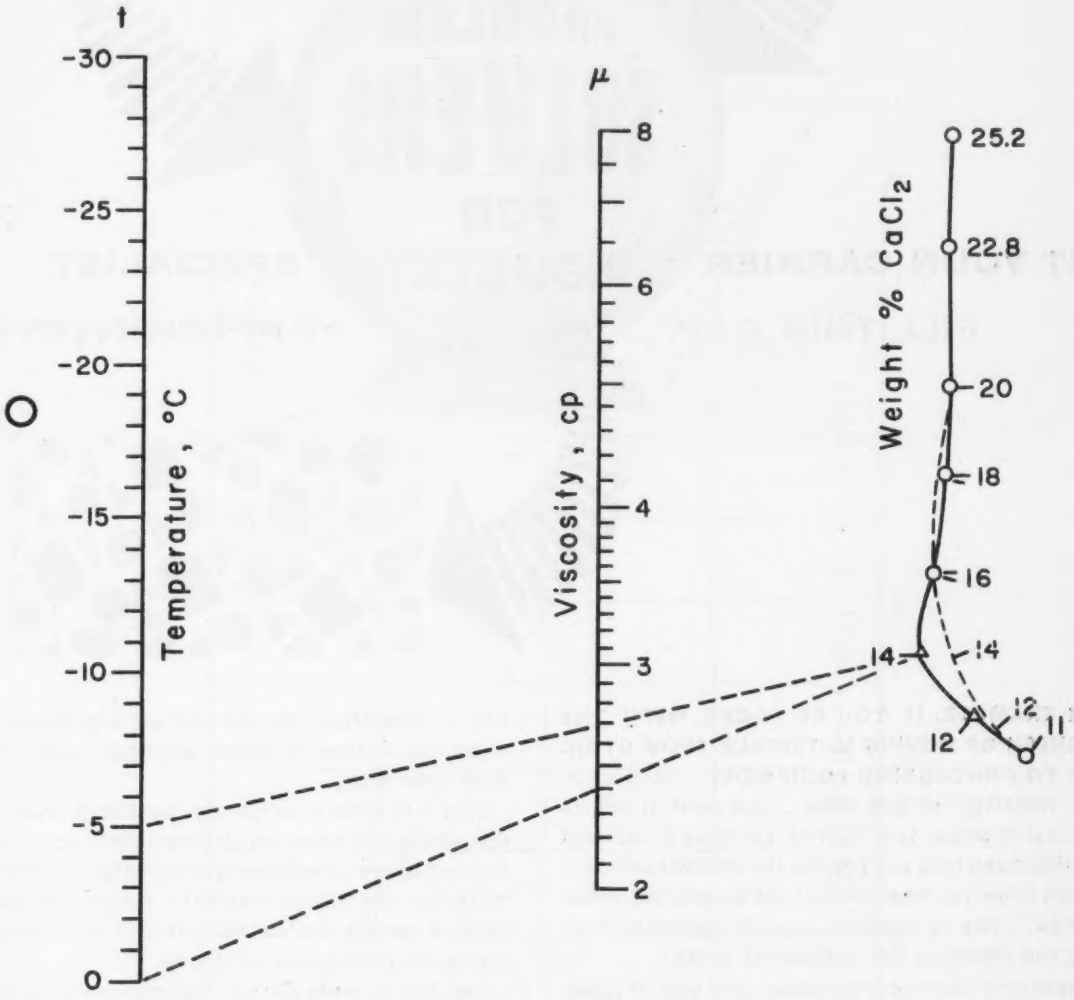

Fig 1

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FOR EXAMPLE, IF YOU'RE FACED WITH THE PROBLEM OF MOVING MATERIALS FROM STORAGE TO PROCESSING EQUIPMENT...need accurate "metering" of flow rates...and want to reduce processing costs, your Carrier Vibrating Equipment Specialist can help you provide the efficient solution. He can show you how you can get substantial power savings...step up capacity...get the operating flexibility and efficiency that cut over-all costs.

Depending upon your operation and type of materials involved, he can show you how you can combine two or more steps into one cost-cutting operation... move and dewater or blend, separate, agglomerate, heat, cool or dry.

Why not have your Carrier Specialist study your operations with a view to reducing handling costs while increasing over-all efficiency. Remember, Carrier does more than just build equipment...we provide the specialized service that solves problems of moving and processing materials efficiently.

Call him or write Carrier Division of CHAIN Belt Company, 229 N. Jackson St., Louisville 2, Kentucky.

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NATURAL FREQUENCY
VIBRATING EQUIPMENT

Check 2985 opposite last page.

NEW LITERATURE

Ideas and New Trends

Federal regulations governing the use of industrial alcohol are brought up-to-date in Government Regulations Guide. Copies may be obtained by letterhead request to Technical Literature Dept., U.S. Industrial Chemicals Co., Division of National Distillers and Chemical Corporation, 99 Park Ave., New York 16, N.Y.

Synthetic fibers are summarized with definitions, table of physical properties, characteristics and in-use applications in pocket-size Fiber Facts Digest—American Viscose Corporation.

Check 2980 opposite last page.

Sampling for dust in process ducts, stacks and vents is discussed and methods for obtaining accurate samples offered in Manual 15—Gelman Instrument Company.

Check 2981 opposite last page.

Over 2000 associations are cataloged in Directory of National Associations of Business Men: 1960, which may be obtained from the Superintendent of Documents, U.S. Government Printing Office, Washington 25, D.C., at 50c each.

Test procedures for evaluating asbestos fibre are presented in 18-page Asarco Bul — American Smelting and Refining Company.

Check 2982 opposite last page.

Labor publications are indexed and abstracted in University of Michigan Index to Labor Union Periodicals which is described in Milup Folder — Bureau of Industrial Relations, School of Business Administration, The University of Michigan.

Check 2983 opposite last page.

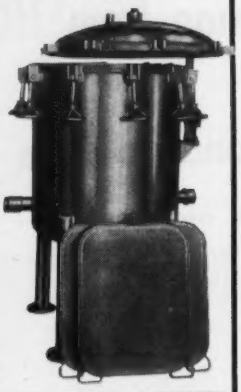
Measurement and control of atmospheric emissions from petroleum refineries is covered in Public Health Publication 763 which may be obtained for 30c from the Superintendent of Documents, U.S. Government Printing Office, Washington 25, D.C.

Polystyrene manufacturers and users will find a simplified explanation of the Food Additives Amendment and its effect on polystyrene usage in Food Additives Amendment Bul — Solar Services Research Division, Solar Chemical Corporation.

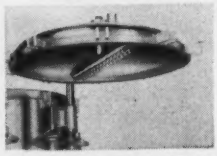
Check 2984 opposite last page.

FOR LIQUIDS WITH A LOW PERCENTAGE OF COMPRESSIBLE SOLIDS.....

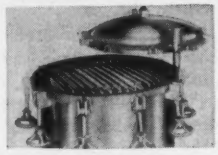
SHRIVER'S TYPE "VTVL" is the FILTER to install



Vertical tank, vertical leaf pressure filter; filter areas from 20 to 510 sq. ft.; tank diameter from 18" to 48".



Sluicing header in cover (optional) directs spray on surface of leaves to slurry cake down for removal from tank.



Showing filter leaves nested in tank.

For clarification or polishing of liquids containing a low percentage of solids, particularly if those solids may be discharged as waste, we recommend the Shriver "VTVL" Filter. It provides convenient, efficient, leakproof filtration at high, uniform rates. There is a size to meet your needs.

For dry cake discharge and for processing more concentrated slurries we recommend the "HTVL" — horizontal tank vertical leaf filter.

Write for Bulletin 146.

T. SHRIVER & CO., Inc.

846 HAMILTON ST., HARRISON, N.J.

Check 2986 opposite last page.

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Construction of Curved Scales on Line Coordinate Charts

From page 91

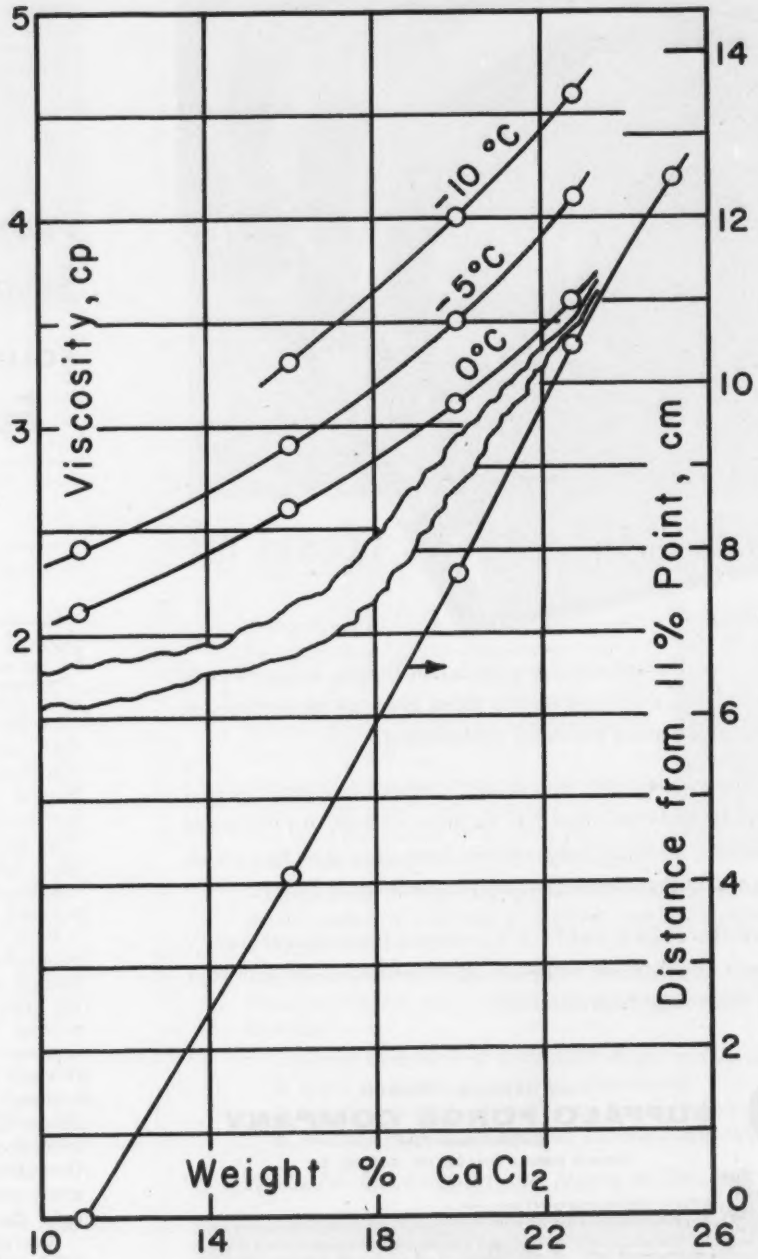

Fig 2

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ON CORROSIVE JOBS EXTEND FAN LIFE 3 to 12 TIMES

By "welding" rubber to all metal parts of a fume fan, Buffalo Forge extends fan life 3 to 12 times. The extra cost for the lining is repaid many times in longer service without downtime losses for replacement.

Other Corrosive Applications may not require rubber-lined fans. Special coatings, stainless steels and other materials are often adequate for the fumes exhausted. For example, 'Buffalo' builds resin-bonded fiber glass fans which are both corrosion and impact resistant to temperatures up to 225° F.

Write today for Bulletins 2424-F and FI-511, outlining the chemical characteristics, volume and pressures of fumes to be exhausted — or call your nearby 'Buffalo' Engineering Representative.

"Buffalo"

AIR HANDLING DIVISION
BUFFALO FORGE COMPANY
Buffalo, New York
Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

Buffalo air handling equipment to move, heat, cool, dehumidify and clean air and other gases.

Buffalo Machine Tools to drill, punch, shear, bend, slit, notch and cope for production or plant maintenance.

Buffalo Centrifugal Pumps to handle most liquids and slurries under a variety of conditions.

Squier machinery to process sugar cane, coffee and rice. Special processing machinery for chemicals.

Check 2987 opposite last page.

HCl fumes paint an eerie picture as they rise from magnesium melting pots. Uncoated roof slabs took severe beating from these fumes

PROBLEM:

Severe roof corrosion from HCl

SOLUTION:

Epoxy-coated concrete slabs

Magnesium plant evaluates 45 materials, believes that 90-mil coating should last over 20 yr

A NEW SOLUTIONS FEATURE

Problem: Hydrochloric-acid fumes were destroying concrete roof covering the big Dow Metal Products plant in Madison, Illinois. A World War II steel casting mill, the installation was taken over in 1953 by Dow Chemical Company and equipped for mass output of magnesium wrought products.

Roof corrosion began when magnesium melting was started in 45,000-sq-ft area of the alloy pot room. Ventilation proved to be inadequate to remove fumes emitted from fluxes. When added to the molten metal, moisture in fluxes produced HCl. Worst corrosion was not directly over the alloy pots but in cooler areas where fumes condensed onto the concrete roof.

Average corrosion on the 1½" webbing of the concrete slabs was measured at seven mils (0.007"). In some places total degradation reached ⅛ to ¼" and had even started to attack reinforcing steel rods in the slabs.

Various protective coatings and repair techniques were tried, but none failed to stop the destructive action of the acid. Some slabs were so deteriorated that a solid surface could not be obtained even with sand blasting. The consensus was that the roof could not be salvaged.

Solution: Concentrated efforts were focused towards the selection of a new roof material. Forty-five products were tested, including coatings tried previously on the old concrete slabs. Materials to replace concrete, such as Admiralty metal, Monel, stainless steel and coated wood, were also investigated. Major considerations were expense (both initial and maintenance), and long-term protection.

Of the 20 materials that appeared to resist corrosion satisfactorily, an epoxy-coated concrete was the least expensive. Coating is based on Dow liquid epoxy resins. Accelerated testing indicated that a

90-mil thickness would hold up for at least 20 years. Even hitting the coating repeatedly with a crowbar failed to loosen it from the concrete. Cost is about 40 cents per sq ft when applied in 90-mil thickness.

The project called for 3319 slabs in 54 sizes. Known as lightweight channel slabs, units are 1" thick in main area (known as the web) and 3½" at the flanges. Most were 7' x 2'. Largest measured 8¾' x 2' and weighed 200 lb.

The method used for applying the protective material consisted of the following steps:

1) Initial cleaning of slabs by sand blasting.
2) Using a 5" brush, apply a filled epoxy primer. Both face and sides of slab were brushed (this took about 8 minutes for an average-size slab).
3) After primer set — which consumed an interval of approximately 20 minutes — slabs were sprayed with epoxy coating to required thickness (average spraying time: 3 min).
4) Immediately after spraying, coating was swept with a broom to eliminate overspray and assure uniform coverage.
5) Slabs were checked for air holes with an electronic void detector.

Finish coat of epoxy being sprayed to concrete slab. Prior to this step, slab was sand-blasted and brushed with primer. A total of 3319 such slabs went into new roof covering the alloy pot room

To install roof, coated slabs were placed on heavy steel beams. Steel clips were used to hold slabs to beams as protection against high winds. Slabs were then covered with conventional roofing material consisting of three layers of felt and pitch.

Henry Rahn, foreman of coating operation, checks coated slab for air holes with electronic device. Bell rings if small sponge on tip of probe crosses an air hole. Moisture in concrete is enough to form completed circuit with large sponge underneath slab whenever an epoxy void is found

Results: The epoxy-coated concrete slabs have satisfactorily solved the alloy pot room's roof corrosion problem. In use for about a year, the roof has been exposed almost continuously to the harsh HCl fumes and fails to show any sign of deterioration.

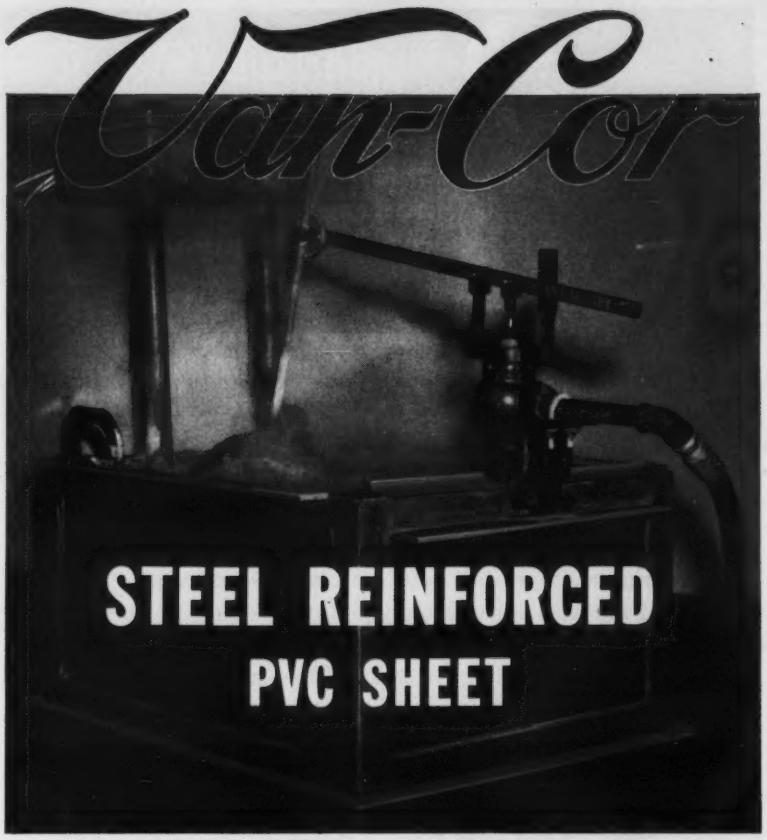
Based on the results of the extensive tests and cost evaluations conducted at the plant, coupled with the roof's performance to date, engineers are convinced that it will fulfill its mission — to provide safe and effective protection at reasonable cost, for a maximum period of time.

(Epoxy coating and spraying equipment used to apply it were produced by The Carboline Company, 32 Hanley Industrial Court, St. Louis 17, Missouri.)

Check 2988 opposite last page.

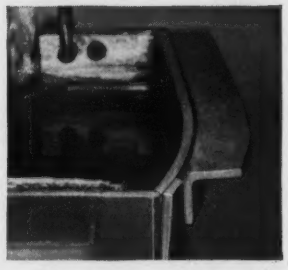
(Further information about epoxy resins may be obtained from The Dow Chemical Company, Midland, Michigan.)

Check 2989 opposite last page.



For Greater Strength, Higher Temperatures

Conventional PVC is never recommended for operating temperatures over 160°F. The small picture at right graphically shows how a tank made of regular PVC distorts within 24 hours when filled with liquid at 212°F.



By contrast, note the main illustration. This undamaged tank is made of Van-Cor steel reinforced PVC. The liquid in it was maintained *at 212°F. for 30 days!*

Resistance to high temperatures is another major new product development by Colonial to broaden the applications of Van-Cor PVC products.

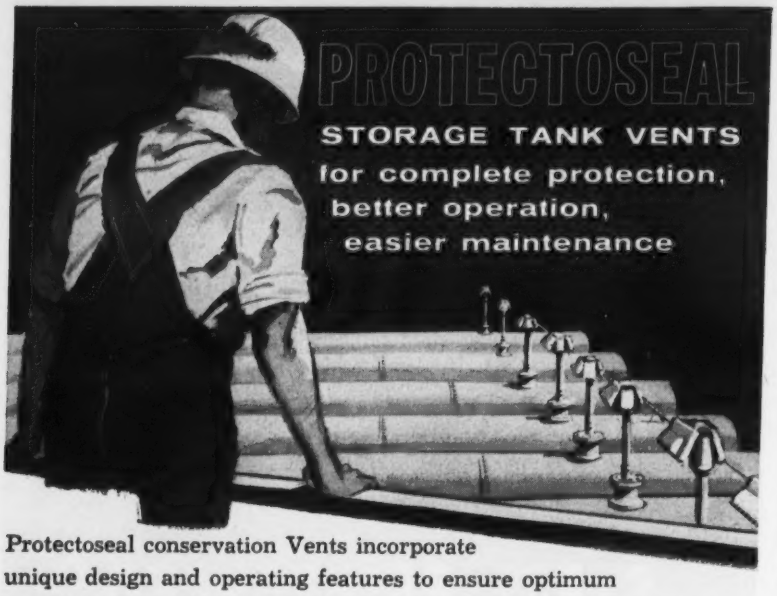
Regular Van-Cor sheet without reinforcement, as well as Pipe, Fittings, Valves and Conduit continue to offer you all these benefits:

1. *Resist Corrosion of Industrial Acids and Alkalies*
2. *Light in Weight (1/2 that of Aluminum)*
3. *Easily Installed; High Tensile Strength; Low Flow Resistance*
4. *Readily Formed, Machined, Threaded and Welded*

Write for Information and Name of Nearest Distributor

INDUSTRIAL DIVISION OF . . .
COLONIAL PLASTICS MFG. CO.
Subsidiary of THE VAN DORN IRON WORKS CO.
2685 EAST 79TH STREET CLEVELAND 4, OHIO

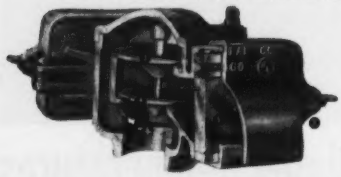
Check 2990 opposite last page.



Protectoseal conservation Vents incorporate unique design and operating features to ensure optimum service on flammable or hazardous liquid storage tanks of every type.

● FLAME ARRESTER DESIGN

Vertically mounted rectangular plate type flame arrester structure is *outside* the housing. Advantages:



1 Pressure tight Aluminum alloy casting
2 Wing Nut on Swing Bolt
3 & 4 Pressure and Vacuum Relief Valves
5 Flame Arrester Structure

1. In the event of fire, the vent burns *at the arrester*, rather than at the valves. This eliminates heat warping or distortion of the valve mechanism.
2. Dirt and other foreign particles cannot reach valves, to cause improper seating.
3. Flame arrester is exposed to corrosive vapors on exhale cycle only. This keeps arrester plates clean longer, requires less maintenance.
4. Self-drainage of condensate.

The interchangeable flame arrester structure is made of heavy gauge metal to resist damage, bending or warping. Accurate, positive air-spacing assured upon re-assembly by embossings on the face of each plate.

A spare arrester can be inserted to safeguard tank interior while original arrester is being cleaned and serviced. Loosening wing nut and pushing swing bolts aside permits quick, easy removal of flame arrester structure.

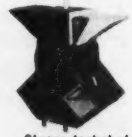
Pressure and vacuum relief valves in Protectoseal Conservation Vents may be fabricated to relieve at settings required by your operating conditions. When severe corrosion is present, the vent housing, valves, and flame arrester structure may be fabricated from special corrosive-resistant metals. Teflon valve seats may also be provided.

Conservation Vents are made in a range of sizes to meet virtually any requirement. UL and FM approved.

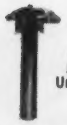
OTHER PROTECTOSEAL EQUIPMENT FOR STORAGE TANK OPERATION

End-of-Line Flame Arrester Vent

In-Line Flame Arrester Vents



Steam Jacketed Vent with Flame Arresters



Combination Fill and Vent Units, Fill Units

Combination Vent Rodding and Sampling Units

Emergency Relief

Write for the Protectoseal Blue Book. Illustrates and describes complete line of Protectoseal Products for hazardous liquid storage tank application.

THE PROTECTOSEAL COMPANY
1932 SOUTH WESTERN AVE. • CHICAGO 8, ILLINOIS

Check 2991 opposite last page.

Sheet of Teflon measures 16 sq ft

King-size sheets of Teflon — occupying 16 sq ft — are being produced on an assembly line basis. Product is available in wide variety of thicknesses.

Teflon is noted for its low coefficient of friction, chemical resistance and liquid repellent property. The sheet can be used to make seals, gaskets, plugs, liners and packings.

(Large Teflon Sheet is product of Fluoro-Plastics Inc., division of Flexrock Company, 3611 Filbert St., Philadelphia 1, Pa.)

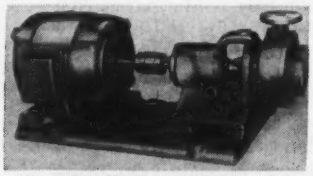
Check 2992 opposite last page.

Pump handles corrosive or abrasive slurries with ease

Impeller has ejector vanes on back

Uses: Pumping relatively small quantities of corrosive chemicals or slurries. Units can handle up to 115 gpm against 150 ft head.

Features: Back wall of impeller has ejector vanes that follow same curvature of main vanes. These prevent solid material from entering and jamming back of impeller. Clearance between vanes and casing can be adjusted.

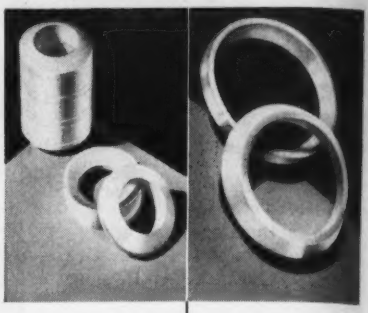


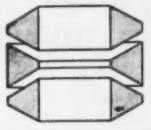
Centrifugal pump is designed for corrosive slurries, can handle up to 115 gpm

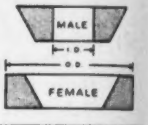
Description: Pumps have 1" flange discharge and 1" and 1½" flanged suction connections. Flanges are flat face 150 lb standard. Frame has wide openings permitting easy access to gland and stuffing box.

Impellers are statically and hydraulically balanced. Stuffing box has five rings of die-formed packing and lantern-

***NEW* CHEMPRO**
LOW GLAND PRESSURE
TFE TEFLON† PACKING SETS







"CUP AND CONE" "WEDGE"

USED FOR VALVES, HEAT EXCHANGERS AND OTHER STATIC AND SEMI-STATIC APPLICATIONS

Chempro Style 300 "Cup & Cone" and Style 305 "Wedge" packing ring sets are two new resilient, low gland pressure packings designed for tight, sure sealing with a minimum gland pressure. Nominal gland pressure causes the rings to slide against each other, exerting pressure both against the stem or rod and the bore.

These packings have all the advantages of Teflon, being completely unaffected by the strongest acids, solvents and alkalies.

COMBINATION SETS AVAILABLE FOR ROTATING SERVICE

Resilient Chempro "Cup & Cone" or "Wedge" rings can be combined with tough, pressure-resisting Chempro Style 101 packing rings to form a rugged combination set ideal for use on a wide range of rotating or reciprocating services.

Write for revised Chempro Bulletin CP-552, giving complete ordering information.

† duPont trademark

CHEMICAL & POWER PRODUCTS, Inc.
9 Broadway, New York 4, N. Y.

Check 2993 opposite last page.

type liquid seal ring. Mechanical seals can be used without making any alterations in stuffing box.

Units are available made of 316 stainless steel, all-bronze, bronze-fitted, iron or Gould-Alloy 20.

(Model 3199 pumps are manufactured by Goulds Pumps, Inc., 216 Black Brook Rd., Seneca Falls, N.Y.)

Check 2994 opposite last page.

Tough plastic compound well suited for tanks, pipe and ducts

Uses: As material of construction for tanks, pipe and ducting.

Features: Plastic compound is capable of resisting temperatures up to 300°F.

Description: Product is a compound of modified furfural alcohol reinforced with glass fibers. Items produced from it

Plastic tank has good corrosion resistance, withstands temperatures up to 300° F

have good physical strength as well as resistance to chemical attack. Material is non-inflammable.

Tests have shown that product can withstand most acids and solvents. It also resists hot alkalis, including sodium and potassium hydroxide.

(Bonate CF-9070 is development of Beetle Plastics of Crompton & Knowles Corp., Fall River, Mass.)

Check 2995 opposite last page.

For more information on developments reported in this section, check corresponding numbers on Reader Service Slip opposite last page of this issue.

LOOK TO POWELL VALVES

You can count on Powell Valves for the answer to virtually any flow control problem where corrosion, erosion, temperature, or pressure are encountered. Because, at Powell, you'll find the largest selection of valves for the chemical industry.

For instance, only Powell offers you such a wide selection of materials—both ferrous and non-ferrous. This includes Stainless Steel, Nickel, Monel*, Hastelloy#, Ni-resist* and aluminum, just to mention a few.

Powell Corrosion-Resistant Valves are also rated up to 2500 pounds W.P. and for temperatures up to 1000F. For complete information and the answer to your corrosion, temperature or pressure problem, contact your nearby Powell distributor or write us directly.

*Registered trade names of The International Nickel Company.

#Registered trade name of Haynes Stellite Company.

115th year of manufacturing industrial valves for the free world

POWELL CORROSION RESISTANT **VALVES**

THE WM. POWELL COMPANY CINCINNATI 22, OHIO

Check 2996 opposite last page.

Tighten Down on FOAM

with Dow Corning Silicone Defoamers*

There's a *right* tool for every job. In foam control it's Dow Corning silicone antifoamers or defoamers . . . job-proved thousands of times over as the most efficient, most economical, and most versatile foam suppressors available.

*At prescribed levels, are sanctioned by FDA

FREE SAMPLE
and new manual on foam control

first in silicones
Dow Corning CORPORATION
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Please rush a FREE SAMPLE of a Dow Corning silicone defoamer for my product or process, which is (indicate if food, aqueous, oil or other): _____

NAME _____

POSITION _____

COMPANY _____

ADDRESS _____

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Check 2997 opposite last page.

Additive ends rust, fights corrosion in water lines

Product forms non-toxic film on metal surfaces

Uses: Preventing corrosion in water systems.

Features: Product is inexpensive and simple to use. Additive is available in either solid or liquid form. Material is non-toxic.

Description: Product was originally developed to stop rust and corrosion in the marine field. Ocean-going vessels and submarines are currently using it in both utility and fresh-water lines.

Properties of additive somewhat resemble sodium silicate, which has a strong affinity for metals. However, exact composition has not been revealed. When added to water system, material forms thin film on all metal oxides, which is air and water tight.

Secondary action is that of chelating. Calcium, magnesium and iron particles suspended in water are trapped. This prevents iron from picking up oxygen and causing discoloration. Mineral salts are stopped from forming scale.

(Further information about Aqua-Clear may be obtained from Sudbury Laboratory, Industrial Division, Sudbury, Mass.)

Check 2998 opposite last page.

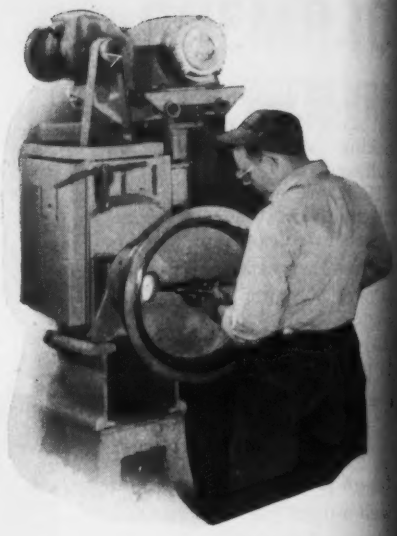
Ti sales soar in '60 — total shipments reach 10 million pounds

Price drops 40% in last five years

Records show that 1960 was a banner year for titanium. Shipments were up 50% over previous year — almost matching second highest production level in the industry's 10-year history.

A total of about 10 million pounds were shipped. Nonmilitary applications, however, accounted for only 15% of the market. Thirteen percent went into construction of commer-

What makes an A-P-C Craftsman?



Loyalty . . . pride of workmanship . . . skill—these are the qualities that make an A-P-C craftsman. A manufacturing specialist in stainless steel, the A-P-C craftsman has made the future of Alloy Products Corp. his future. Setting for himself highest product standards, he takes special pride and care in making every A-P-C product a product that fulfills your stainless steel needs best. These qualities combined with engineering know-how . . . complete, modern facilities—all under one roof—guarantee products with longer service life and lower maintenance costs. A-P-C stainless steel craftsmen keep your profits in mind on every job.

Just a postcard brings a quick reply to all your stainless steel requirement questions.

Craftsmen in Stainless Steel SINCE 1929

ALLOY PRODUCTS CORP.

1075 PERKINS AVENUE • WAUKESHA, WISCONSIN

Check 2999 opposite last page.

need more information . . .

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Specialists for
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SPECIALISTS in meeting *your* requirements for stainless sheet, plate, tube, pipe, bar, rod, wire, billet, valves, fittings, fastenings, or PVC.

SPECIALISTS in making *your* deliveries promptly from the convenient stocks in nearby warehouses.

For Example: *ESCO* can furnish all types of corrosion resistant valves for every fluid handling requirement. Ball, diaphragm, gate, globe, check and angle valves are available in all sizes. Custom valves in special alloy steels can also be furnished.

SPECIALISTS in metallurgical know-how equipped with industry's most modern laboratory facilities to help solve *your* special problems.

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8425 Ontario Street.....FAirfax 5-2288

cial aircraft. Sales to chemical industry accounted for the other 2%. Latter market looks increasingly promising, since 1960 shipments doubled previous year's and reached 200,000 pounds.

The good showing made by titanium can be attributed to a number of factors, most important of which is the stiffening price competition titanium is giving the more established engineering metals.

Commercially-pure titanium sheet and strip and alloy bar and billet now costs $6.97 per pound — compared to $11.97 in 1956. Sponge costs $1.60 per pound.

Welded To Steel

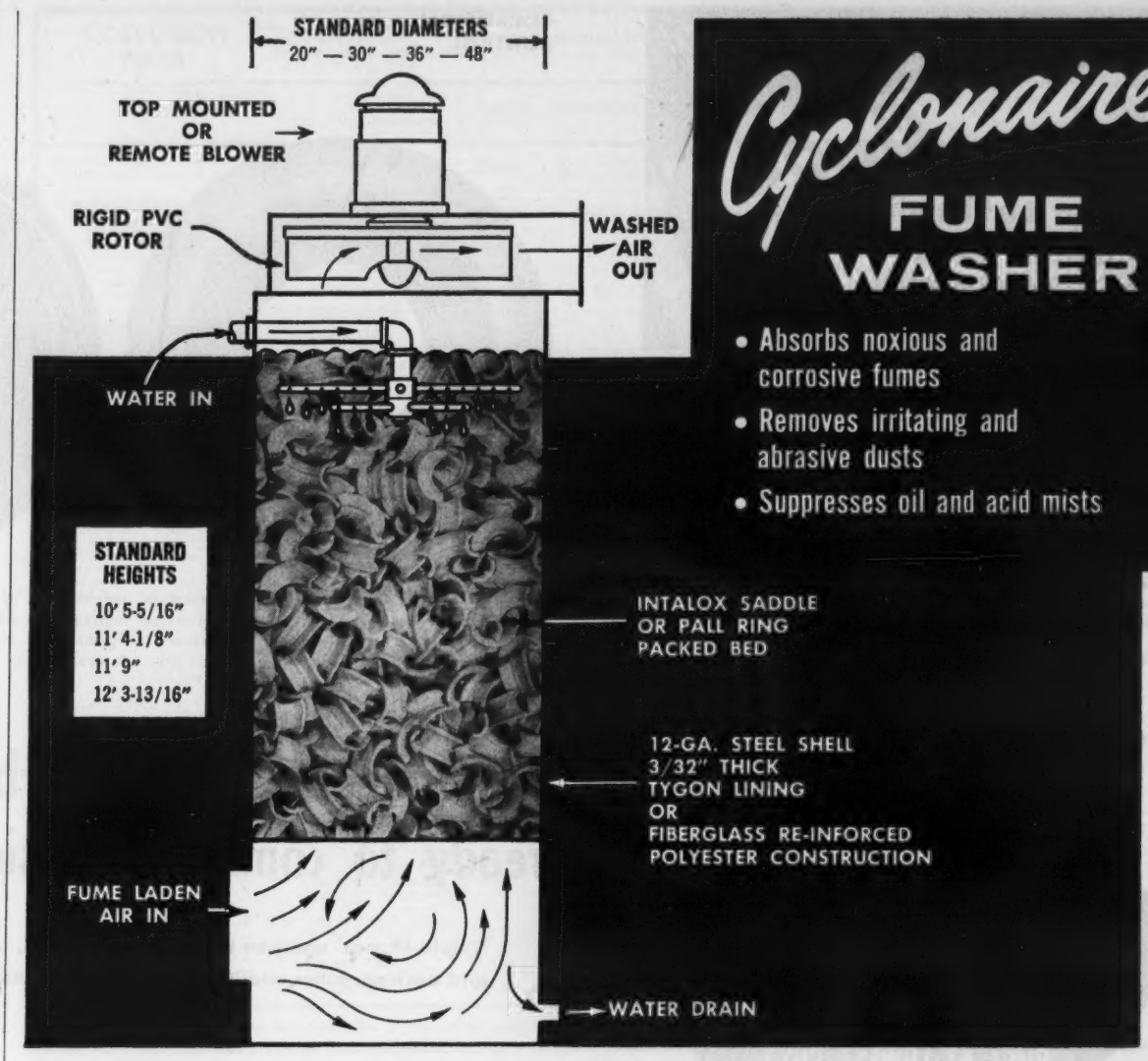
One of the major technical achievements of the industry in 1960 was the development of techniques for welding titanium to steel. This permits use of thin-gage titanium for lining vessels, tanks and duct work at prices almost comparable to conventional corrosion-resistant equipment.

(Further information about titanium may be obtained from Titanium Metals Corporation of America, 233 Broadway, New York 7, New York.)

Check 3000 opposite last page.

"And on this particular date, you started wearing that d---- sweater around the plant."

Henry Gaines Goodman, Union Carbide Chemicals



Cyclonaire FUME WASHER

- Absorbs noxious and corrosive fumes
- Removes irritating and abrasive dusts
- Suppresses oil and acid mists

The "Cyclonaire" is a surprisingly compact wet bed scrubber. It will fit almost anywhere, but it does a fume removal job formerly possible only with expensive custom-designed units. Removal of many gases (of 1% concentration or less) is up to 99% effective. Low power requirements make it very economical to operate.

The "Cyclonaire" is available fabricated either from 12-gauge steel, lined with 3/32" thick Tygon sheet plastic, or from fiberglass re-inforced polyester resin. The lined-steel unit comes complete with a top-mounted blower equipped with a rigid polyvinyl chloride (PVC) rotor. The lighter weight fiberglass re-inforced polyester unit utilizes a separately mounted blower duct-connected to the unit.

Both units are shipped complete with the necessary packing — Intalox porcelain saddles, metal or poly propylene Pall Rings—depending upon the corrosive conditions or weight limitations existing.

The "Cyclonaire" is available in four sizes with rated capacities of 750, 1650, 3500 and 6000 cfm.

Its low initial cost, its low operating cost, its high efficiency make the "Cyclonaire" a logical choice for a wide range of fume scrubbing operations. Full technical data in Bulletin FW-10R. Write for it today.

PROCESS EQUIPMENT DIVISION

U. S. STONEWARE

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AKRON 9, OHIO

376F-3

Check 3001 opposite last page.

→ *This simple test will prove that* ***Chemplast*** *makes the difference in* ***"teflon".***

Hold a "Chemfluor" Sheet in front of a light source. Note the uniform translucency and the complete absence of cloudiness and discoloration. These visual effects signify:

- UNIFORMLY HIGH DENSITY
- ABSOLUTE FREEDOM FROM CONTAMINATION

Chemfluor sheets are also characterized by their: pure whiteness, high heat stability, closely controlled dimensions, and exceptional flatness. They meet the requirements of AMS-3651B and the SPI standard for polytetrafluorethylene sheet. Stocked for immediate delivery in standard sizes of 12" x 12", 24" x 24", and 48" x 48". (Thicknesses from 1/32" to 2") Chemplast also supplies molded and extruded rods and tubes, tape, and custom machined parts of teflon.

Phone or write for prices or information.

*DuPont's TFE Fluorocarbon Resin.

HU 5-4850 CHEMPLAST, INC.
3 CENTRAL AVE., EAST NEWARK, N. J.

Check 3002 opposite last page.

Don't throw maintenance money away!

NoDrip TAPE PERMANENTLY PROTECTS AGAINST CONDENSATION AND RUST AT LOWEST COST.

Any maintenance man can check this. Handy 16' rolls of ¼" thick NODRIP TAPE fits any size pipe or fitting. Never absorbs moisture. *Permanently* insulates against damaging pipe sweating—even around unions, tees, angles and valves.

NoDrip PLASTIC COATING

Another fine Mortell product. Use on metals, concrete, brick, tile, plaster surfaces. Apply by brush, trowel or spray to large pipes, tanks, walls, ceilings, air ducts, to eliminate sweating. 1 or 5 gal. cans or 55 gal. drums.

At all leading hardware, mill supply and plumbing jobbers. For full information and technical handbook, write

Mortell COMPANY
530 Burch Street, Kankakee, Ill.

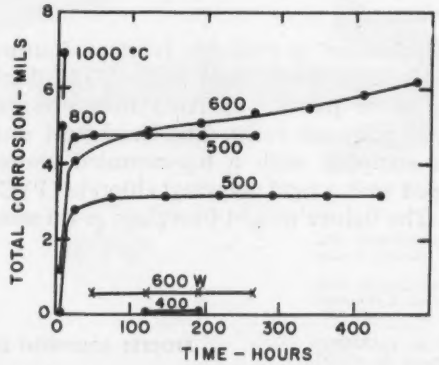
Check 3003 opposite last page.

Comparison of discs used in beneficiation of taconite iron ore. Unit at left is made of dense, impermeable silicon carbide; shows no sign of wear after 16 weeks. Special alloy disc at right wore out after only 3-4 weeks service

Impermeable silicon carbide—ready to combat corrosion at 1000°C

'Triple-threat' weapon boasts top chemical, hardness and anti-abrasive qualities; can handle fused salts, molten metals

R. E. DIAL, Assistant to Director
and **G. E. MANGSEN,** Senior Engineer
Research & Development Division
The Carborundum Company
Niagara Falls, New York



Corrosion of impermeable silicon carbide in chlorine gas

SILICON CARBIDE — one of the toughest substances known to man — may soon provide engineers with a practical solution to some of the difficult corrosion, erosion and abrasion problems that have been stumping them in the chemical processing and allied industries.

A dense, impermeable form of it is currently being produced in limited quantities. Equipment components fabricated from the material are being exposed to punishing evaluation tests. Results indicate that the substance may well fill the bill for many applications where no suitable material now exists.

Use Ceramic Forming Techniques

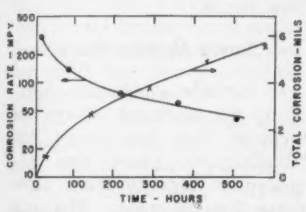
Dense, impermeable silicon carbide components can be formed by conventional ceramic techniques, such as pressing in steel molds, casting or extruding. Large intricate shapes may be fabricated from a variety of grit sizes of commercial or high-purity silicon carbide.

After forming, parts are subjected to

a high-temperature treatment which produces the dense, self-bonded bodies. Surface of this product is rather rough due to crystal growth during heating process. However, a smooth, dense surface can be produced by grinding and polishing.

Withstands 1000°C

The material's outstanding properties are excellent hardness and chemical and abrasion resistance, plus ability to withstand high temperatures. Certain fused salts, molten metals and gases can be successfully handled by it at temperatures up to 1000°C. This asset should make the material "a natural" for use in heat-



Corrosion of impermeable silicon carbide in mixture of 40% HF and 10% HNO_3 at 60°C

exchanger and high-temperature-furnace components.

Chemical resistances is first-rate either in dilute or concentrated solutions of HCl, H_2SO_4, HNO_3 or H_3PO_4 at temperatures up to 225°C. Corrosion resistance is fine to 500°C dry chlorine, to 600°C in wet chlorine. Good resistance is also reported to CO, H_2 and air at 1000°C; and moderate resistance to pure O_2 at 500°C.

Performance in either boiling 10% Na_2SO_4 or Na_2CO_3 is good. Tests indicate that chemical resistance in low concentrations of NaOH is also quite satisfactory. However, in NaOH concentrations above 25% poor results have been obtained.

The product's corrosion resistance in molten metals varies from excellent to unsatisfactory. Fine results are reported in tin up to 400°C, lead at 600°C. Poor resistance

CORROSION DATA

20 Selected Results from Service and Laboratory Tests Comparing Ni-Resist with Cast Iron under 400 Different Conditions. Data on comparative service of Ni-Resist in the other corrosive environments may be obtained in the booklet offered below.

Corrosive Medium	Location of Test Specimens	Duration of Test	Temperature °F	Aeration	Velocity	Average Corr. Rates i.p.y. Cast Iron	Ni-Resist**	Type Ni-Resist Preferred
Acetone, 5 parts, and one part Oleic Acid—Linoleic Acid mixture	Separator Tank	131 days	35.6-102 dys. 68.0-150 hrs.	None	None	0.0004	0.00006	1-2
Ammonia, 5-6% by vol.; 150 p.p.m.; Phenol carried by water vapor	Top of phenol tower	309 days	215.6	None	750,000 cu. ft./hr.	0.002	0.0009	1-2
Ammonium, Saturated Sulfate in 3-10% H_2SO_4, plus coke oven gas	Saturator on "Cracker Pipe"	77 days	131	None	Violent	0.08	0.002	1
Calcium Hydroxide (Lime Water)	Laboratory		60	Some	None	0.003	0.0002	1-2
Carbon Dioxide, saturated aqueous solution	Laboratory		60	Some		0.03	0.001	1-2
Coal Tar (High Chloride Content)	Fractionating Column							
	Top	154 days	390	None	Some	>0.2	0.006	3
	Middle	154 days	515	None	Some	0.013	0.001	3
	Bottom	154 days	550	None	Some	0.006	0.003	3
Fertilizer, Commercial "5-10-5" Chemical Fertilizer	In contact with damp granules in storage	290 days	ATM	Some	None	0.010	0.003	1-2
Gasoline (end point containing H_2S & mercaptans plus H_2O. 11-13% chrome steel trays badly corroded)	On top of 24th tray of tower	70 days	370-432	None	Some		0.0027	
Hydrochloric Acid 2%	Laboratory		68			0.88	0.005	1
Paper pulp with small amounts of SO_2, Cl_2, H_2SO_4, pH 4-4.5	Decker effluent	198 days				0.006	0.002	1-2
Petroleum: Crude Oil (reduced, containing 0.584% S)	Bottom of crude tower	290 days	500	None	Turbulent		0.0033	1
Petroleum: Crude Oil (sour, cracked, 0.106% H_2S, & 0.066% mercaptan S)	Top tray or reflux tray of tower	132 days	342-352	None	Gas 26g/m		0.0028	1-2
Sodium Chloride	Salt Brine tank	180 days	50	Considerable	Some	0.010	0.003	1
Sodium Hydroxide 30% plus heavy concentration of suspended salt	Salt tank	82 days	180	Moderate	Moderate	0.0063	0.0001	4
Sodium Phenolate, with 20% (by vol.) tar acids. Total alkalinity of 20% by wt. NaOH	In phenol tower	329 days	248	None		0.002	0.0007	2
Steam condensate with dissolved O and CO_2	In condensate return line	30 days	180	Good	By flow	0.002	0.0004	1-2
Steam	In a nipple expanded pipeline from high pressure steam line	31 days	350	Good	120 lb.	0.002	0.0007	2
Water, brackish, East River, N. Y. C.	Water box of Steam Power Plant	334 days	54	Yes	High	0.010	0.002	1
Water, salt, from oil wells	In salt water pit	217 days	60	Slight	By flow	0.02	0.001	1-2
Water, sea	Intake flume	740 days	ATM	Considerable	5 ft./sec.	0.050	0.002	2

**Consult with Inco for specific corrosion rates for the various types of Ni-Resist.

How Ni-Resist irons "rate" against 20 corrosives

Also possessing excellent mechanical properties, corrosion-resisting Ni-Resist can be specified for a broad range of applications for the toughest service conditions

If you're looking for more satisfactory service life from your fluid handling equipment, you may be surprised by the economies that Ni-Resist* irons have to offer.

That's because Ni-Resist irons — with their Nickel content and austenitic matrix —deliver a unique combination of engineering properties:

They resist corrosion and erosion — they stand up to thermal shock—they have great strength and toughness—they resist metal-to-metal wear.

The unique properties of Ni-Resist irons are cast easily into compressors and blowers, filter drums, kettles and pipe. Ni-Resist irons prolong the life of pump casings, liners, wear rings and impellers. Boost the performance of valves and valve trim components.

In all these applications, Ni-Resist irons deliver the much needed corrosion resistance and mechanical properties. What's more, they *deliver them with cast-metal-economy.*

If the specific media in which you are interested are not given in this list of 20, you can obtain more complete corrosion data by writing us for a copy of "Engineering Properties and Applications of Ni-Resist." A postcard will do it. *Inco Trademark

THE INTERNATIONAL NICKEL COMPANY, INC.

67 Wall Street INCO New York 5, N. Y.

Mechanical and Physical Properties of Ni-Resist

	TYPE 1	TYPE 2
Tensile Strength (thousand psi)	25-30	25-30
Thermal Expansion (70-400°F)		
(millionths per °F)	10.7	10.4
(millionths per °C)	19.3	18.7
Magnetic Response	Non-Magnetic	Non-Magnetic
Modulus of Elasticity (million psi) (at 25% of Tensile Strength)	12-14	15-16.2
Hardness, Brinell:		
low chromium	130-170	125-170
high chromium	140-190	140-190
Toughness (Izod Impact Test) (foot-pounds) 1.2 arbitration bar unnotched—struck 3" above supports.	100	100
Machinability	Good	Good

NI-RESIST

NICKEL MAKES IRONS PERFORM BETTER LONGER

Check 3004 opposite last page.

is exhibited to magnesium at 750-800°C.

In fused salts at 900°C, results show excellent to poor resistance with NaCl, MgCl, KCl, LiCl, LiF and $CaCl_2$, in that order. The product's corrosion rate in fused NaOH and Na_2CO_3 is fairly high.

Boosts Sleeve Life 2000%

Impermeable silicon carbide components have already found their way into a variety of applications. Two examples are on wear-sleeve tubes for pulp reactors and as "flat-box" covers in pulp and paper industry where corrosive liquors at elevated temperatures are encountered. As applied to the first case, and replacing steel components, the carbide units have upped sleeve life from 48-72 hours to a minimum of 1500 hours.

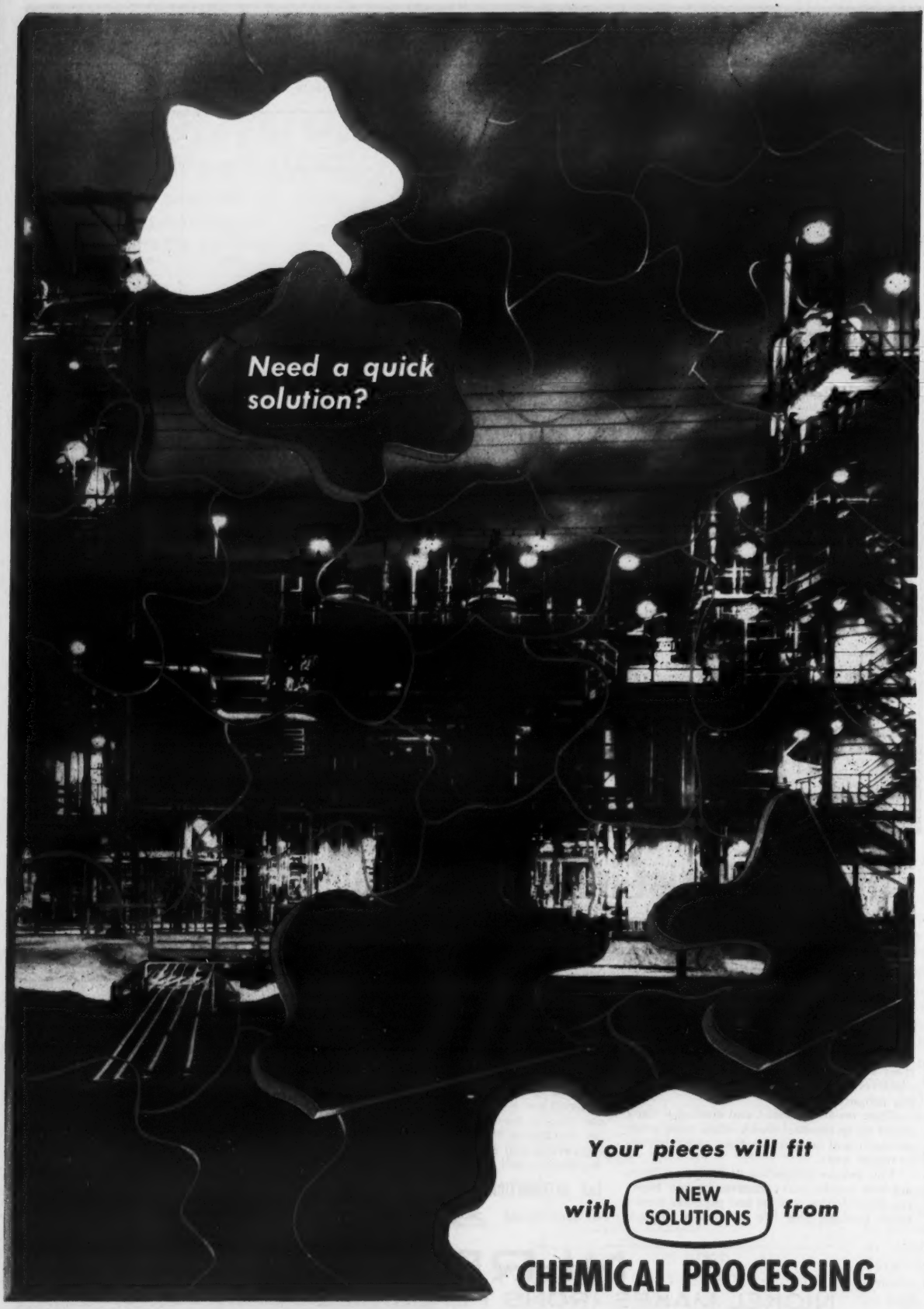
Tames Abrasive Slurry

A carbide apex disc handling an abrasive slurry of taconite iron ore at an ore beneficiation plant has revealed no sign of wear after more than 30 weeks. The unit processed 50,000 tons of ore during that time. Special alloy disc previously used wore out after only three to six weeks service.

Other applications where impermeable silicon carbide components are working out well include: valve seats handling H_2SO_4-nickel ore slurry at 204°C; tap-out block in reverberatory furnaces in aluminum plant handling aluminum or aluminum alloys at 800°C; and as fuel-element cladding and structural parts for gas-cooled nuclear reactors. The product has also been successfully tested in the laboratory as a missile nose cone in air at 1900°C.

Plans are to continue testing the impermeable silicon carbide at high temperatures in additional gases, salts and metals. Emphasis will also be placed on more detailed evaluations in acidic solutions, vapors and other difficult environments encountered in industry.

(Condensed from technical paper presented at 1960 High



Temperature Symposium of the National Association of Corrosion Engineers in Dallas, Texas.)

(Further information about "KT" silicon carbide may be obtained from The Carborundum Company, PO Box 337, Niagara Falls, New York.)

Check 3005 opposite last page.

▸ A NEW SOLUTIONS ARTICLE

Tantalum condensers play important role in phosgene plant

Resist 300°F HCl, assure purity, economy

Tantalum condensers have shown that they have what it takes to withstand tough corrosive conditions at Delmar Chemical Company, Inc., Elkton, Md. One of the largest commercial producers of phosgene and phosgene derivatives, the plant has five production units in operation.

Each system includes a glassed-steel reactor, receiving tank and tapered condenser.

A typical reaction involves the output of diethyl carbonate. Phosgene and ethyl alcohol are reacted in the reactor. Vapors consisting of diethyl carbonate, ethyl chloroformate, phosgene and HCl pass into the condenser at temperatures up to 300°F. Product is then purified by refluxing and distilling.

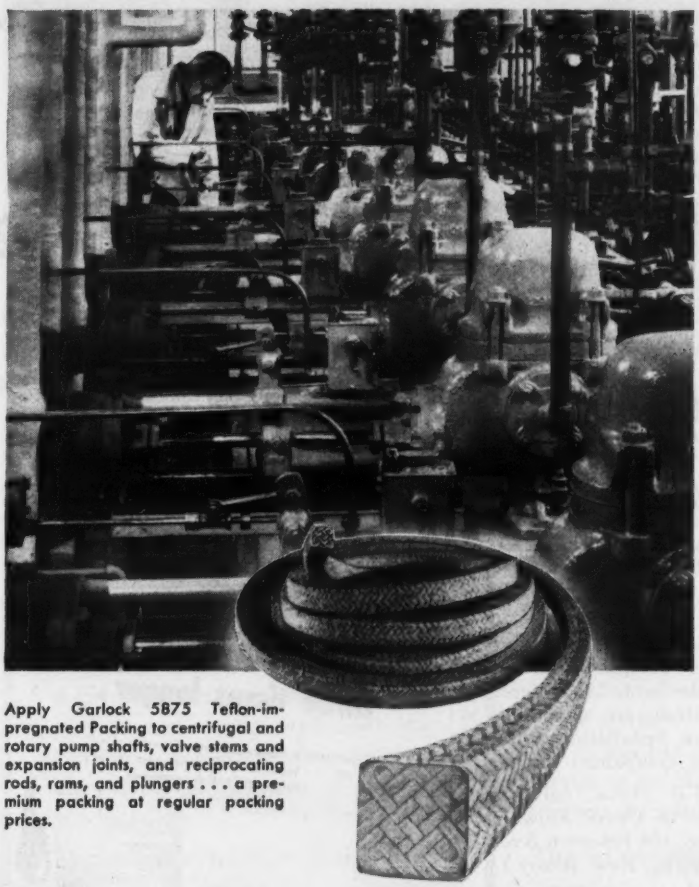
Brine is cooling liquid used in the condenser. Brine enters at −20°F and drops temperature of carbonate down to a range of 70 to 140°F. Noncondensables and HCl pass into scrubbing tower.

Experience with the tantalum condensers since 1951 has shown that they resist corrosion, asure purity of product and are essentially maintenance-free. Tantalum patches have also been used with excellent results to repair glassed-steel tanks.

(Further information about tantalum may be obtained from Fansteel Metallurgical Corporation, Metals-Fabrication Division, North Chicago, Ill.)

Check 3006 opposite last page.

ENGINEERED TEFLON PRODUCTS
for Chemical Processing



Apply Garlock 5875 Teflon-impregnated Packing to centrifugal and rotary pump shafts, valve stems and expansion joints, and reciprocating rods, rams, and plungers . . . a premium packing at regular packing prices.

NOW—YOU CAN BUY GARLOCK TEFLON* PUMP PACKING AT REGULAR PACKING PRICES!

Through an improved manufacturing technique, Garlock offers a Teflon-impregnated LATTICE BRAID† Packing at a reduction of approximately 40% over the price of similar competitive packing. Designated Garlock 5875, this packing can be purchased at prices comparable to regular packing.

Enjoy premium benefits without a premium price. Garlock 5875 offers a high Teflon content—more than 30% by actual weight—for greater protection, reduced wear. In temperatures from −90° F to +500° F, Teflon-impregnated LATTICE BRAID Packing is recommended for use against moderately destructive and corrosive mineral acids and caustics. For more destructive and corrosive applications, Garlock 5888 Teflon-treated fiber packing is recommended. Teflon, too, is as "frictionless" a material as you will find; this greatly reduces wear to the packing itself, and to any moving parts that it contacts during normal operation.

Specialized construction provides longer life, less maintenance. Garlock 5875 Packing is made from Teflon-impregnated white asbestos yarn, woven in the superior LATTICE BRAID construction. Here, each strand of treated yarn is intertwined at a 45° angle through the packing body. This completely integrates the structure for greater strength and, unlike ordinary square or round braid, eliminates individual *layers* of yarn—layers that, once worn through, destroy the usefulness of the packing. Without a layer or single outer braid to wear through, LATTICE BRAID remains unified without disintegrating far beyond the limits of other packings.

Enjoy fast delivery from warehouse stock. Garlock 5875 Packing is immediately available in sizes from ¼" through ⅝" in either spool or reel form to meet your specific needs; also available on order in ring form in these sizes. Specify now from your local Garlock representative at the nearest of the 26

GARLOCK

Garlock sales offices and warehouses throughout the U.S. and Canada. Or, for more information, write for Catalog AD-185, Garlock Inc., Palmyra, New York.

Canadian Div.: Garlock of Canada Ltd.
Plastics Div.: United States Gasket Company

Order from the Garlock 2,000 . . . two thousand different styles of Packings, Gaskets, Seals, Molded and Extruded Rubber, Plastic Products.

*DuPont Trademark for TFE Fluorocarbon Resin
†Registered Trademark

Check 3007 opposite last page.

You could have paid the last bill for pipe corrosion 25 years ago . . .

There are many PYREX® glass pipe installations that old and older—corrosive installations—which are still as smooth, clean and serviceable as they were the day they were first put to work.

Take a moment to estimate roughly what pipe corrosion costs *you*. With PYREX glass pipe, the difference can be as lopsided as 100%. Here's why:

PYREX pipe is resistant to more acids and acidic materials than any other pipe. It delivers even the most active of acids without a trace of corrosion.

Problems of side reaction, pickup, and contamination are practically nonexistent—even at temperatures up to 450°F.

How much could you save in the *next* 25 years if you never had to replace a corroded pipe?

Bulletin PE-3 has all the facts. It's yours for the asking.

CORNING GLASS WORKS
2903 Crystal Street, Corning, New York
CORNING MEANS RESEARCH IN GLASS

Please send me Bulletin PE-3, PYREX Brand "Double-Tough" Glass Pipe and Fittings.

Name.....
Title.....
Company.....
Address.....
City..... Zone..... State.....

Check 3008 opposite last page.

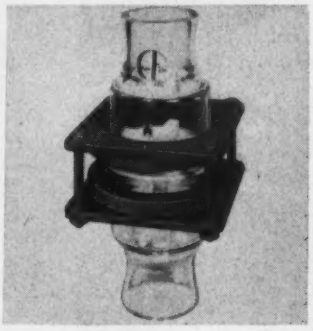
'See-thru' check valve permits quick survey of liquid, gas flow

Resists corrosives, can operate at 50 psi

Uses: Controlling flow of liquid corrosives.

Features: Check valve is constructed of Teflon and Pyrex-brand glass which provides visibility as well as corrosion resistance to all liquids except hydrofluoric acid and hot concentrated caustics.

Description: Valve is designed for operation in vertical position. Patented lip seal on seat assures positive sealing against fluids and gases.



Transparent check valve is made of Teflon and Pyrex-brand glass

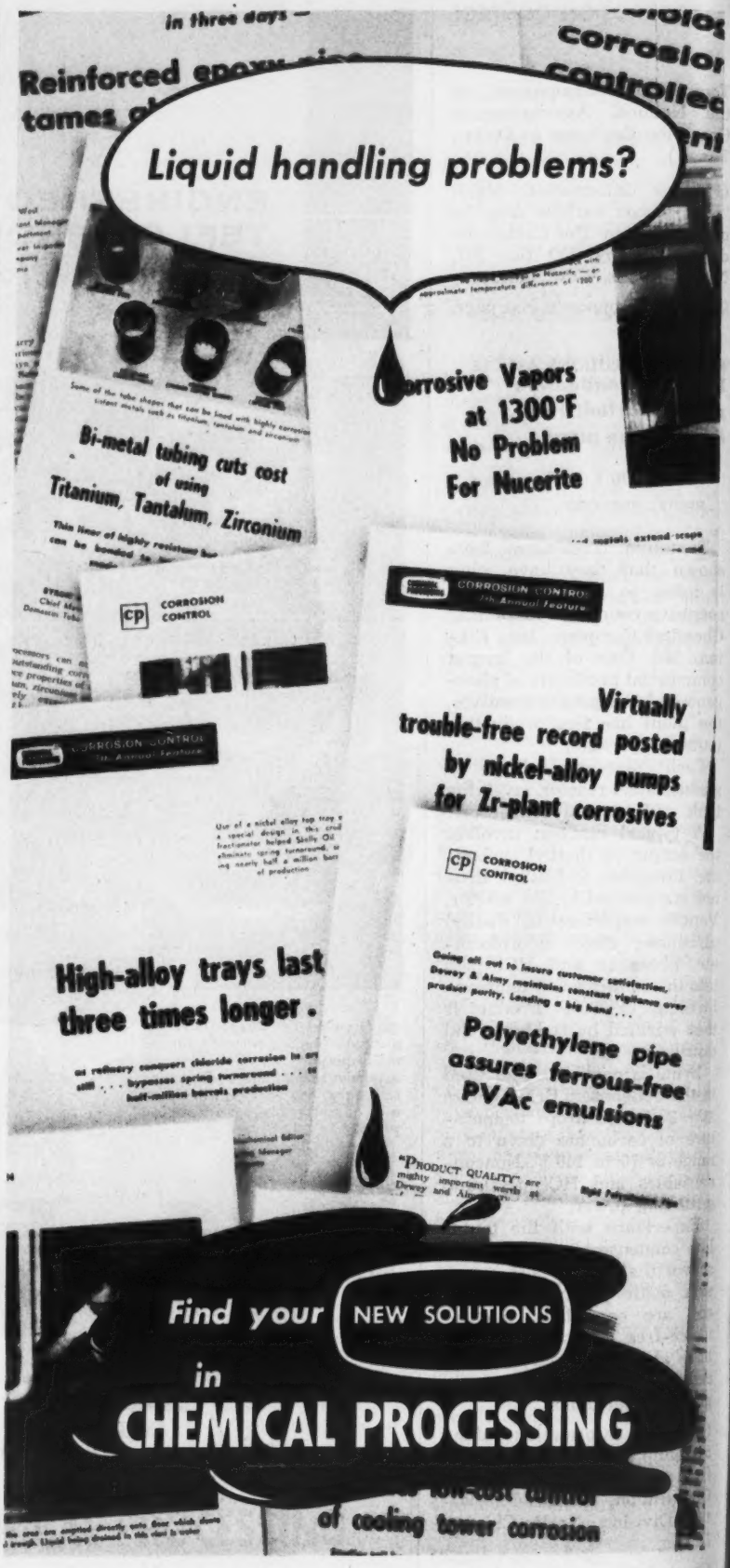
Maximum operating pressure is 50 psi. Valves are available in 1, 1½, 2 and 3" sizes. Units are adaptable to any pipe installation with 150 lb ASA companion flange.

(Model-R check valves are product of Chem Flow Corporation, 108 Paterson Avenue, Little Falls, New Jersey.)

Check 3009 opposite last page.

NEXT MONTH

Big problems often have simple answers. Case in point: Baugh Chemical Co., where an economical wire-mesh, acid-mist separator solved a serious air-pollution and roof-corrosion condition. Savings realized in H_2SO_4 recovery alone (1000 lb per day) were enough to pay for the unit in less than 18 months. Don't miss this story in the April issue!


Liquid handling problems?
Bi-metal tubing cuts cost of using Titanium, Tantalum, Zirconium
Corrosive Vapors at 1300°F No Problem For Nucerite
Virtually trouble-free record posted by nickel-alloy pumps for Zr-plant corrosives
High-alloy trays last three times longer.
Polyethylene pipe assures ferrous-free PVAc emulsions
Find your NEW SOLUTIONS in CHEMICAL PROCESSING
of cooling tower corrosion

NEW LITERATURE

Corrosion Control

The story of glass-lined steel is told in 20-page, full-color bulletin. Technical information includes discussion of operating temperatures, thermal shock, heat transfer and resistance to acid and alkalis.

Five charts illustrate resistance to various temperature-concentration combinations of nitric, acetic, sulfuric, hydrochloric and phosphoric acids. Numerous photographs depict manufacturing steps as well as applications of equipment. Bul 985 — The Pfaudler Co., a Division of Pfaudler Permutit Inc.

Check 3010 opposite last page.

Mastic protective coating for retarding corrosion of metals, cement and other products is discussed in four-page bulletin. Chart tells number of gal needed to provide specific film thicknesses. "Pioneer No. 1008 Vapor Seal" — Witco Chemical Company, Inc.

Check 3011 opposite last page.

Feeder for injecting chemicals into water systems to retard corrosion is subject of two-page bulletin. Chemical head, connectors and pump body are made of high-impact plastic. Unit will feed 2.4 to 24.0 gpd at zero psi. "Feeder Model P-3" — Hagan Chemicals & Controls, Inc.

Check 3012 opposite last page.

How to select solenoid valves for corrosive applications is told in 16-page manual. Plastic materials of construction are recommended for over 500 different chemicals. Literature includes seven full pages of valve selection charts. Manual 108 — Valcor Engineering Corporation.

Check 3013 opposite last page.

Modular tank sections made of glass-fiber reinforced polyester resins are summarized in 11-page folder. Five tables of technical data list chemical resistance, physical properties and other information. Bul "Custom-molded Fibreglass" — Poly-Fibre Associates Incorporated.

Check 3014 opposite last page.

Diffusion coatings capable of boosting oxidation resistance of many alloys at temperatures up to 2300°F are considered in four-page folder. Coatings can be applied to wrought or cast parts in a variety of alloys and metals. "Diffusion Coatings" — Haynes Stellite Company, Division of Union Carbide Corporation.

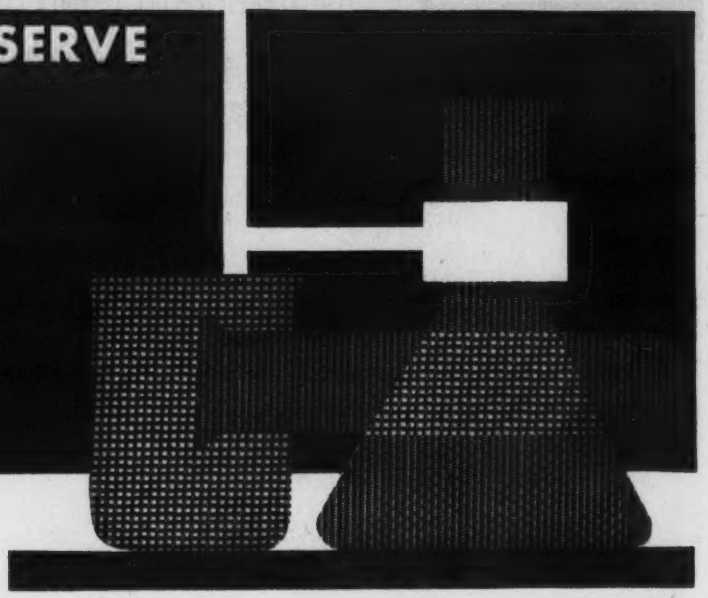
Check 3015 opposite last page.

use wire cloth in critical operations?

THEN THEY DESERVE

Cambridge

WIRE CLOTH QUALITY & SERVICE



What is Cambridge Quality?

Wire that consistently meets metal or alloy analyses. Trained operators and modern looms to produce cloth from any metal or alloy in any weave. Constant inspection to assure high accuracy in mesh count and mesh size. Craftsmen to make fabrications in any size, shape or quantity to exacting specifications.

This is Cambridge Wire Cloth Quality.

What is Cambridge Service?

Prompt answers to mail or phone inquiries. Experienced Field Engineers—experts in their field—who can help you select the wire cloth to do the best job at lowest cost. Prompt deliveries. Large stocks of frequently used cloth for immediate shipment. Follow-up service to see that our product is giving you the results you want.

This is Cambridge Wire Cloth Service.

Your Cambridge Field Engineer can show you how Cambridge quality and service can help you in your operation. Call him at any time. He's listed in the Yellow Pages under "Wire Cloth". Or, write direct for illustrated 120-page catalog.

Refer to our technical data sheet in CHEMICAL ENGINEERING CATALOG, Page 185.

The Cambridge Wire Cloth Co.

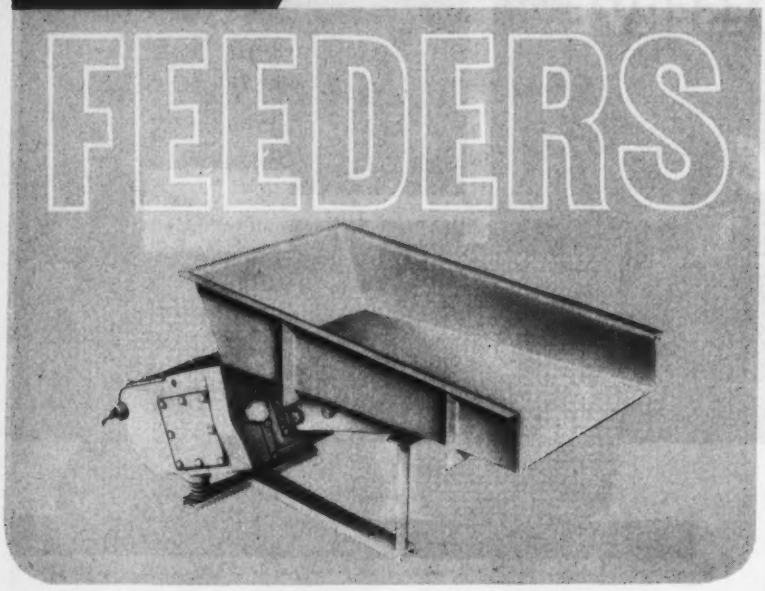
Department: F • Cambridge 3, Maryland

Manufacturers of Metal-Mesh Conveyor Belts, Flat Wire Conveyor Belts, Wire Cloth, Wire Cloth Fabrications and Gripper ® Metal-Mesh Slings.

Check 3016 opposite last page.

MOVE BULK MATERIALS MORE EFFICIENTLY

SYNTRON VIBRATORY FEEDERS



COMBINE DEPENDABILITY, HIGH CAPACITY AND CONTROLLED FEEDING

Now, you can buy a plant proven Vibratory Feeder designed to handle a great diversity of particle sizes.

Powered by Syntron's electromagnetic drive—simple, powerful, void of mechanical moving parts—assures dependability, long life and low maintenance. Instant control of amplitude permits quick, accurate adjustment of material flow.

Available for floor or suspension mounting with flat pan or tubular trough in sizes to meet every feeding requirement.

Write for a Syntron Catalog and the name of the representative near you.

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SYNTRON COMPANY
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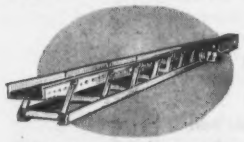
Other Syntron equipment of proven dependable quality

Packer & Jolters



Mechanical Vibrating Conveyers

Flow Control Valves

Check 3017 opposite last page.

Wagon train being assembled

In switching from drums to rubber bins, interplant transportation posed a problem which Dow engineers solved by designing unique carts which carry . . .

Bins via wagon train

A UNIQUE WAGON TRAIN is helping The Dow Chemical Company's Midland Division realize greater savings from a shift to bulk handling of saran polymer powder between the Polymer plant and the Saran Wrap plant at Midland, Mich.

Dow converted from drums to bulk handling in November 1958 with purchase of 500 collapsible rubber bins (Sealdbins) — capacity 70 cu ft or up to 3300 lb of powder.

Once the bins are filled and inventoried on a power-and-free-type conveyor, one man takes over the handling operation. He drives the lift truck (using special crane boom with "live" load line), which carries the bins to the wagon train composed of up to five "honey carts", each accommodating two bins.

Designed by Dow but manufactured by another firm, the honey carts, so dubbed by Dow employees, have front and rear steering, the latter limited to minimize turning radius.

After assembling train, the operator uses the special lift truck to haul it to the wrap plant where he unloads the bins, placing them either in outside storage or beneath a hoist which carries them to the second floor storage area.

From storage, a crane system conveys the bins over the hopper area, where they self-unload through the 6" bottom opening. A protective sleeve prevents spillage. Bins are changed about once every 24 hr. The truck operator also controls this operation and keeps inventory. Empty bins are returned to the Polymer plant via wagon train.

Reliable outside sources indicate that the bins and asso-

ciated equipment paid out in a year. The bins are expected to be usable for 10 yr. Spillage, formerly 2%, is now negligible, handling has been minimized and some storage space has been converted to manufacturing use. Cost of drums and pallets has been eliminated.

(Sealdbins are a product of the Transportation Products Dept., United States Rubber Company, 10 Eagle St., Providence, R.I.)

Check 3018 opposite last page.

(Liftruk Sealdbin handler is made by Silent Hoist & Crane Co., Inc., 841-877 63rd St., Brooklyn 20, N.Y.)

Check 3019 opposite last page.

▸ A NEW SOLUTIONS FEATURE

"Sticky" packaging problem solved by drum lining

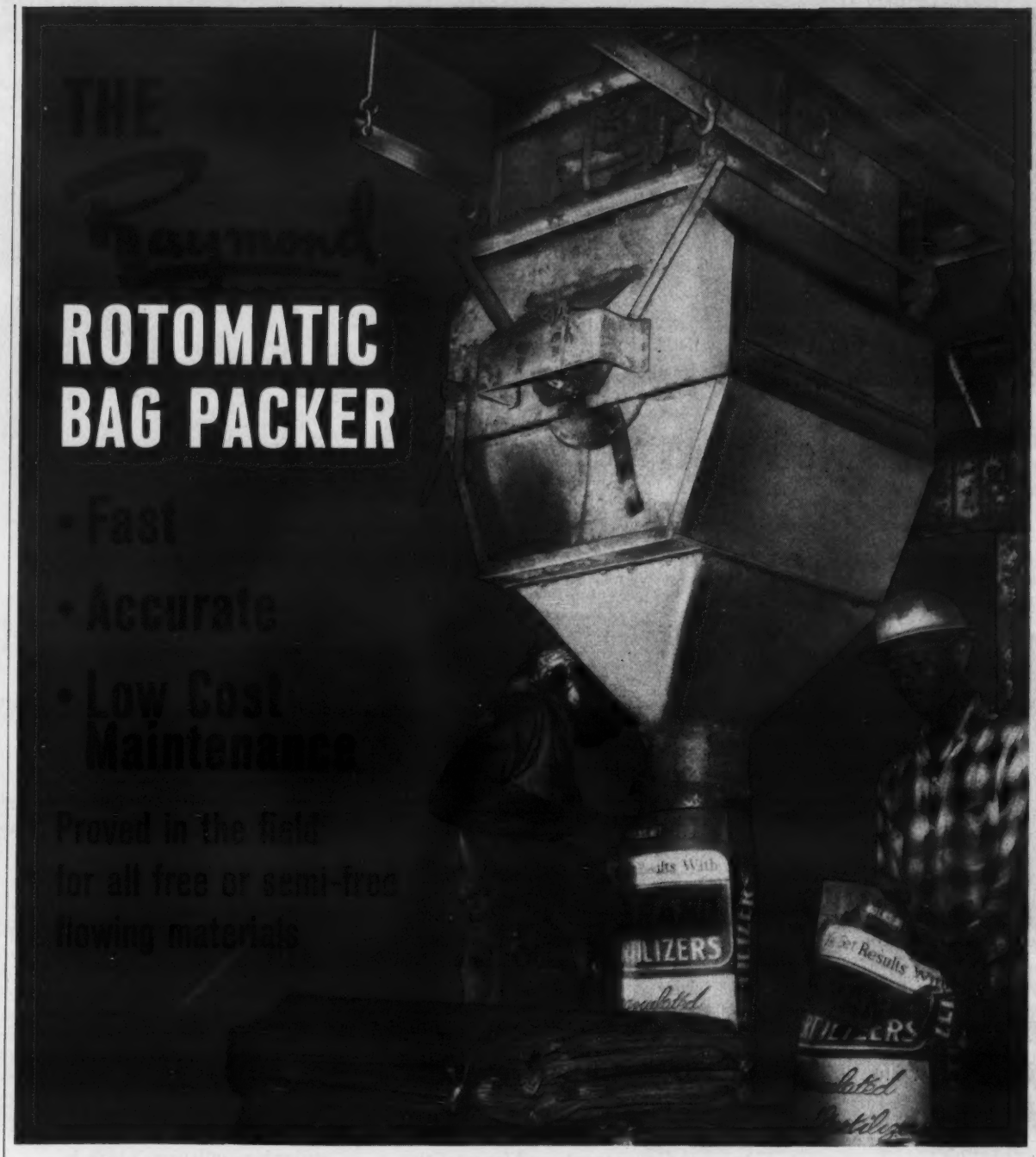
Problem: Enjay Company, Inc., a major petroleum refiner which produces adhesive component LM Vistanex, was troubled by complaints that the product was too difficult to remove from the drum. In some cases, the container had to be split open with an ax and adhesive scraped out — a time-consuming and wasteful process.

Solution: Tests were conducted, using a release coating on the inside of the drums. Tests showed that the adhesive component could be completely removed from the drum in a few minutes.

Results: Enjay converted completely to lined drums for shipping LM Vistanex. In addition, three major drum manufacturers are now offering metal drums and pails lined with the release coating for packaging sticky materials such as resins, adhesives, asphalt, and so forth.

(Dux-Sol release coating is manufactured by the Dri-Dux Division, Resisto Chemical, Inc., PO Box 1945, Wilmington 99, Del.)

Check 3020 opposite last page.



That's right! Speed, Accuracy and low-cost maintenance . . . proven in full production line operation. It's the Bag Packer that can give you new economy in your bag packing operation. The Raymond Rotomatic Packer is fully automatic, all mechanical, and requires no outside motivation such as electricity or compressed air. It is gravity operated and uses the even balance scale principle to deliver proved accuracy. Get complete details now from your Raymond representative or write

Raymond BAG CORPORATION
Middletown, Ohio • A Division of Albemarle Paper Mfg. Co.
Atlanta • Baltimore • Chicago • Kansas City • Louisville • New York
"Maker of RUGGED MULTIWALL PACKAGING for Industry"

Check 3021 opposite last page.

It shows you how measurement of weight or force is applied for AUTOMATIC CONTROL

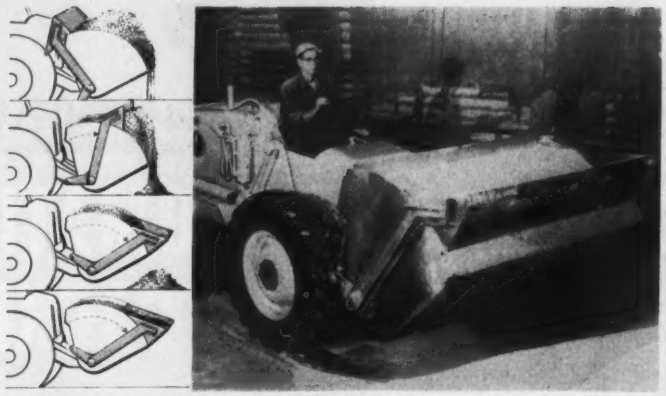
It's FREE! No obligation

This valuable new reference manual, packed with explanatory diagrams, presents many control possibilities offered by a proven weight-sensing principle. It shows how the principle is applied for control of basic operative functions in automated machines; for control of processing equipment; and for quality control operations. Here is a source of ideas that can lead to the solution of problems concerned with weighing or control by weights. Write for your free copy of "Weight Sensing."

Exact Weight SCALES

THE EXACT WEIGHT SCALE CO.
905 W. FIFTH AVE., COLUMBUS 8, OHIO
In Canada: 5 Six Points Road, Toronto 18, Ont.

Check 3022 opposite last page.



Action of combination strikerbar-spillguard in removing excess load from scoop is depicted by sequence of drawings

Bulk spillage balked by device on scoop

Strikerbar-spillguard on tractor-shovels cuts yield loss, housekeeping costs

YIELD LOSS, housekeeping expense and cost of re-processing bulk materials spilled during in-plant transit can be circumvented by a bucket-device being introduced on manufacturer's tractor-shovel models. Loads can be more uniform, too.

The redesigned buckets are equipped with a combination strikerbar-spillguard which is moved hydraulically from the back of the bucket along the curved side sheets to the front.

This action (see photo and drawings) strikes off excess material scooped into the bucket from the storage pile.

When the bucket is rolled back and lifted to carry position, the strikerbar remains in position. During the trip from storage to delivery point, it serves as a front spillguard, retaining the load.

To empty the bucket, the strikerbar is retracted, and normal dumping procedure followed.

Operation of the device is controlled by a lever located behind the regular valve control levers in the operator's compartment. Arrangement of the hydraulic system permits bucket and strikerbar operations to be handled separately.

The higher bucket side sheets prevent spillage from the sides.

(Further information on the HA, H-25 or HAH Payloader machines (2000-lb, 2500-lb, and 3000-lb capacities) with No-Spill buckets may be obtained from The Frank G. Hough Co., subsidiary of International Harvester Company, 744 Seventh Ave., Libertyville, Ill.)

Check 3023 opposite last page.

THAT'S INTERESTING

Seeks body thermostat

How the body regulates its own temperature and where this thermostat is located is the object of research being conducted by Dr. Madeline M. Fusco, University of Michigan instructor.

Dr. Fusco says the hypothalmus, a small region deep inside the brain, houses some sort of "thermostat" which governs those functions which maintain a delicate balance between heat production and heat loss.

Sun-lit cigarets

A cigaret lighter, invented by John Garret Thew of Westport, Conn., harnesses sunlight to provide smokers with a "light."

Produced in two sizes, a round model, 4½" in diam, lights a cigaret in 5 sec; a smaller oval model, 3 x 4", requires 10 sec.

For more information on product at right, specify 3024 see information request blank opposite last page.

New slanted "full-vision" cowl that makes load pick-up unusually fast and easy, is an outstanding feature of Towmotor Stream-Liner Series fork lift trucks (above). Load capacities, 3000 to 5000 lbs. Diagram below shows how operator is able to see within 12" of the heel of forks.

TOWMOTOR'S ON THE MOVE

—in more plants, in more ways, with more money-making features. On the move, handling more materials, gaining lost storage, speeding distribution. On the move, raising productivity, lowering costs, increasing profits. Get going with Towmotor fork lift trucks and carriers—made only by TOWMOTOR CORPORATION, CLEVELAND 12, OHIO.

TOWMOTOR
THE ONE-MAN-GANG®

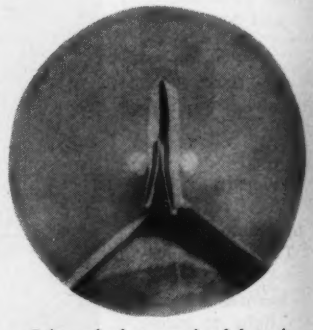
Impact strength doubled by four-ply closure for sewn-end multiwalls

Study shows 70% of failures occur on sewing line

A four-ply kraft tape closure, which reportedly doubles the impact resistance of sewn-end multiwall bags, is expected to minimize bag breakage at the sewing line, where 70% of all sewn multiwall bag failures occur.

The closure consists of a piece of kraft tape, edges of which have been folded under the sewing line with the needle passing through four layers of the tape, instead of two layers as in a conventional closure.

Development of the closure stemmed from intensive studies of bag breakage carried out by the manufacturer. The company's laboratory found that even when tensile readings are high, breakage



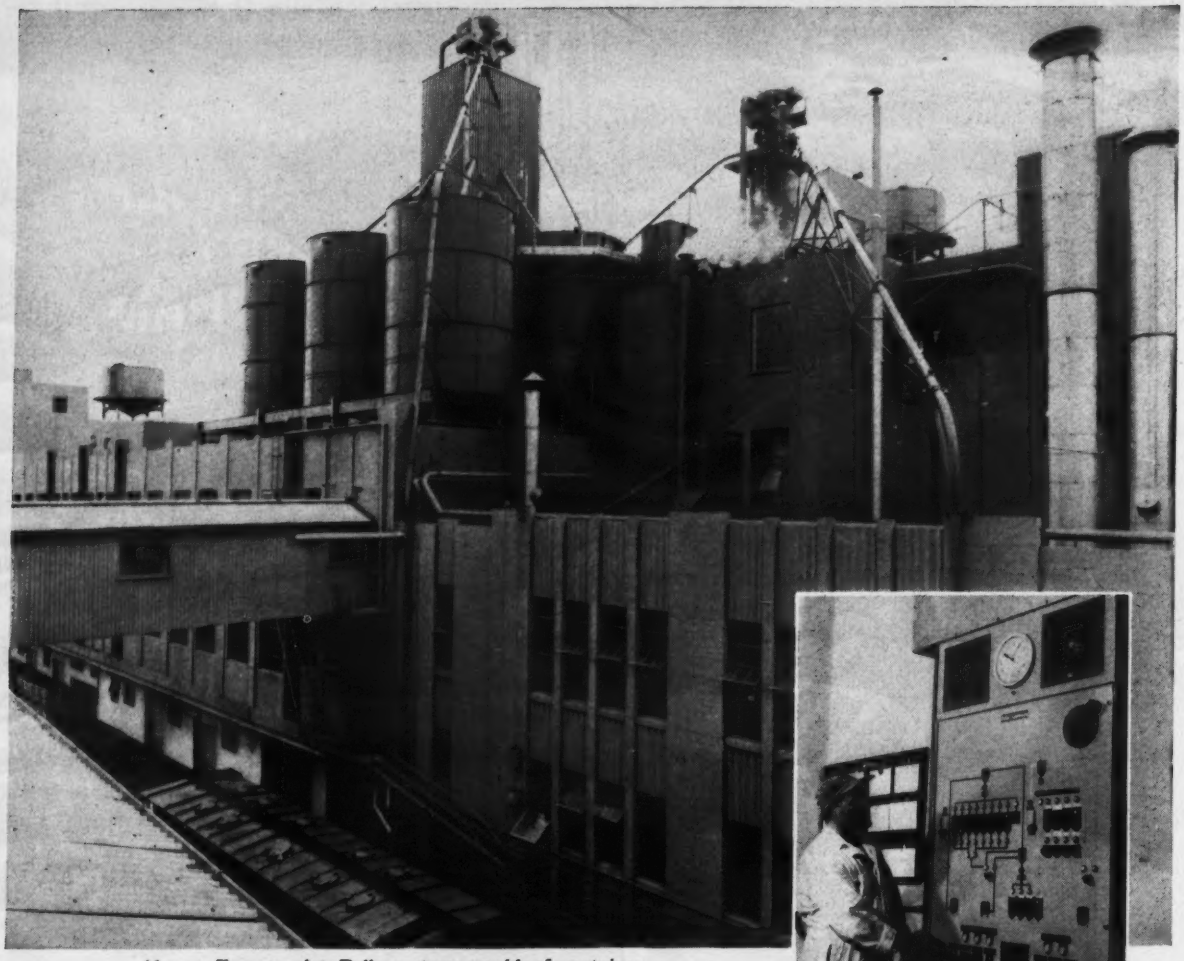
Enlarged photograph of four-ply tape closure showing application on sewn end multiwall bag

can occur at the sewn ends. This is due to the fact that while the tensile of a sewn end normally varies less than 10%, its ability to absorb shock can vary up to 200%.

The company's packaging laboratory developed a method of using the impact-resistance test to register the toughness of a sewn end by duplicating shocks met under field conditions.

This pinpointed the problem and led to development of the tape.

The tape is now available on all closures made in the manufacturer's bag plants, and modification equipment is



Above: Two complete Fuller systems capable of emptying 100,000 lb. car in three hours, unload General American Dry-Flo® cars to storage bins on the roof.
Right: Graphic, push-button, one-man control panel handles unloading, conveying and reclaiming.

NO PLACE TO GROW BUT UP

. . . so Burgermeister put 12 new storage bins on the Brewhouse roof

Putting a head on beer is one thing, but putting a head on the Brewhouse roof might seem an insurmountable obstacle. This growing San Francisco brewery was up against it for storage space. With no further room for lateral expansion, the only place to grow was up—but how? Could additional bins be loaded at such a height?

Fuller engineers were able to provide the answer. Airveyor® Pneumatic Conveying Systems don't balk at height. So twelve additional bins were mounted on top of existing equipment, and two separate Airveyor systems were installed. They even incorporate components from an existing Airveyor system which had been installed in 1947.

Now, with ample storage space, grits are unloaded from covered hopper cars to bins in just over three hours per 100,000-lb. car. The same quantity of malt travels the route in a little over two hours. And reclaiming and blending are handled at an equally high rate—all controlled by one man at a Fuller graphic control panel. Burgermeister has greater production with greater economy — as breweries must do to keep ahead today.

The success of Fuller in handling problems like those at Burgermeister is confirmed by repeat orders from customers everywhere. Breweries nation-wide look to Fuller to study their needs for expansion, higher production and for new brewery installations. Why not find out for yourself why they do it—and what Fuller can do for you? 2625 A-29 2

See Chemical Engineering Catalog for details and specifications

FULLER COMPANY GENERAL AMERICAN TRADE MARK

FULLER COMPANY
136 Bridge St., Catasauqua, Pa.
Subsidiary of General American Transportation Corporation
Offices in Principal Cities Throughout the World

Fuller
. . . pioneers in harnessing AIR

Check 3025 opposite last page.

being developed which will make it possible for customers to apply the tape themselves.

(Further information about ImpacTape can be obtained by requesting Bul 350, (sewn open mouth bags) or Bul 351, (sewn valve bags) from Multiwall Bag Division, West Virginia Pulp and Paper Company, 230 Park Ave., New York 17, N.Y.)

Check 3026 opposite last page.

Plastic-laminated burlap cover for outdoor storage

Uses: Outdoor storage cover for heavy machinery and other bulky items.

Features: Seams and hems are rubberized and heat-fused eliminating stitching and needle holes. Inner burlap ply prevents sharp corners or other protrusions from damaging the outer polyethylene-film moisture barrier.

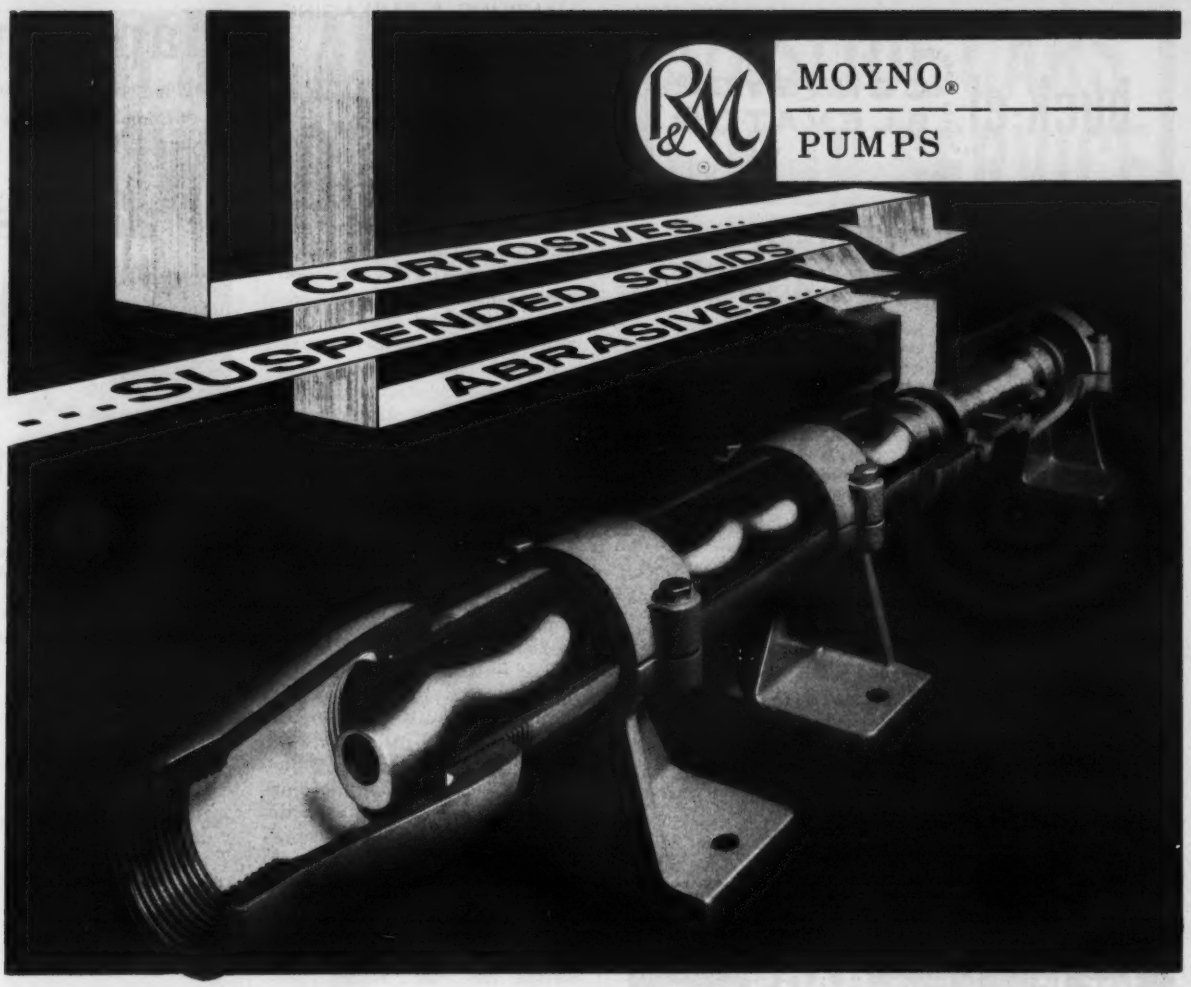
Description: Available in flat form or in a preformed construction, cover is made by special burlap and polyethylene lamination process. It will withstand extremely high or low temperatures. At sub-zero temperatures, the cover remains flexible and may be folded for storage or easy handling.

Pre-formed construction of plastic-laminated burlap cover prevents dirt and dust contamination of item

Plasticized construction permits escape of rust-causing condensation. It is available with grommets or without.

(Burlene cover is a development of the Bemis Bro. Bag Company, 408 Pine St., St. Louis 2, Mo.)

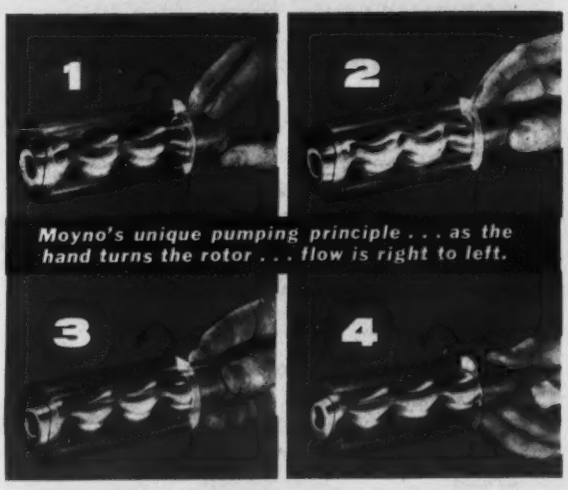
Check 3027 opposite last page.



MOYNO® *solves tough pumping problems!*

Moyno's "progressing cavities" successfully handle thin watery slurries, non-pourable abrasives, gnawing corrosives or suspended solids up to 1⅛" dia.—without crushing, foaming or aerating! Material contacts only one moving part, a screw-like rotor revolving in a double-threaded stator. Where corrosives or abrasives are to be handled, rotor and stator are made of special resistant materials that minimize maintenance and prolong pump life. Many materials now pumped by Moyno were once considered "unpumpable" . . . had run up prohibitive maintenance costs on other type pumps or ruined them completely!

Moyno pumps are available in capacities to 500 gpm; pressures to 1000 psi. Learn more . . . write today for new Bulletin **100-CP!**



Moyno's unique pumping principle . . . as the hand turns the rotor . . . flow is right to left.

ROBBINS & MYERS, INC., Springfield, Ohio

Fractional and Integral HP Electric Motors • Electric Hoists and Overhead Traveling Cranes • Moyno® Industrial Pumps
Propellair® Industrial Fans • R & M-Hunter Fans and Electric Heat • Trade-Wind Range Hoods and Ventilators
Subsidiary companies at: Memphis, Tenn., Pico Rivera, Calif., Brantford, Ontario.

Check 3028 opposite last page.

buck-el CONVEYOR ELEVATOR

AVAILABLE FROM STOCK

New, BUCK-EL LIFT-IT KIT bucket elevator for elevating bulk materials. All components pre-engineered, shipped boxed ready for quick on-the-job assembly. Complete instructions. Anyone can do it.

Elevate powdered, granular or lumpy materials at rate of 4 CFM.

Buckets—belt or chain mounted.
Drive—use with your own motor or we will furnish to suit.
Feed—controlled by built-in slide gate at inlet.

Ideal for loading Blenders, Mixers, Hoppers and other Process Machinery.

Write for Catalog Sheet and Price Data

NEW IDEAS for elevating and feeding bulk materials
standard designs adapted to your requirements

write or telephone buck-el CONVEYOR ELEVATOR The Bucket Elevator Co. tel: MErcury 5-0600 24 Commerce St., Chatham, N. J.

Check 3029 opposite last page.

CUT COSTS for Packing BAGS

FILL and WEIGH with

CODDINGTON AUGER-MATIC *Bag Packer*

Low Cost, portable AUGER-MATIC packs any material from powder to pellets in paper bags . . . shuts off automatically when desired weight is reached.

Valve bags fit snugly on AUGER-MATIC spout so no dust escapes . . . keeps bags clean . . . eliminates costly tieing or bag closing equipment.

---------FILL OUT AND MAIL TODAY.---------

E. D. CODDINGTON MFG. CO.
5036 N. 37th Street, Milwaukee 9, Wisconsin

Please send me facts on Cutting Valve Bag Packing Costs

MY NAME.....
COMPANY.....
ADDRESS.....
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Check 3030 opposite last page.

Seal for waxed, painted strapping uses coating to provide strong bond

Currently being introduced is an entirely different approach to strap sealing which utilizes a special high-friction mastic compound to coat inside surface in area within which crimping action occurs.

When crimps are applied, mastic compound "bites through" slippery strap coating to provide strong frictional bond between metal surfaces.

The seal is being used only with painted, painted and waxed or waxed Magnus and heavy-duty strapping in 1¼" widths.

Seal was developed to solve a problem posed by the introduction of painted and waxed finishes for Magnus and heavy-duty strapping. Although these finishes provided more efficient utilization of these types of strapping, the slippery surface gave a joint of inadequate strength with ordinary heavy duty crimp seals. Increasing the gage of crimp seals was considered, but this increased sealing effort correspondingly.

For joints substantially as strong as the strap, two seals, each crimped twice with the manufacturer's improved crimp sealers, are recommended. Two types are available—the 114G and 107G (both 22 gage). The 114G is 2¼" long and may be used with either a B-1435 or UB-1435-50 sealer. The 107G, measuring 2-15/16", can also be used with a pneumatic sealer.

(Microgrip seals are a development of Signode Steel Strapping Company, 2600 N. Western Ave., Chicago 47, Ill.)

Check 3031 opposite last page.

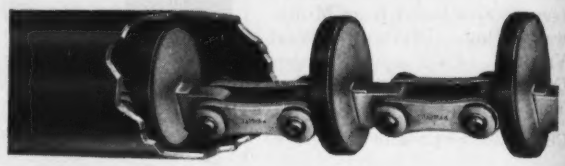
For more information on developments reported in this section, check corresponding numbers on Reader Service Slip opposite last page of this issue.

Hapman Conveyors

offer you these outstanding features for your flowable material:

• Completely flexible • Compact • Self-cleaning
• Self-supporting • Self-feeding • Dust, odor-tight

almost always



cost more

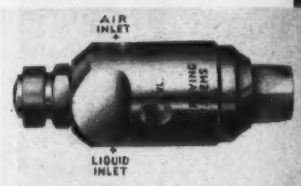
. . . but return their cost many times. Sound engineering, superior materials and workmanship go into every Hapman installation. With Hapman tubular conveyors you have minimum wear, minimum degradation, and maximum trouble-free performance. This is why you may pay more initially, but with Hapman you can be sure of the best conveying system . . . and save in the long run.

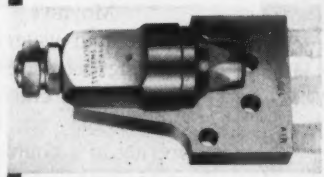
For Fact-Finding Report on Hapman Conveyors, write today to:
Dept. CP-3

Conveyor Division HAPMAN CORPORATION
630 Gibson St. • Kalamazoo 6, Mich.

Check 3032 opposite last page.

pneumatic atomizing **SPRAY NOZZLES**





for **AUTOMATION**

Spraying Systems offers a complete selection of automatic pneumatic atomizing nozzles for use where controlled intermittent spraying is required. In-built shut-off valve is air operated. Precision built for exact control of spray type and volume. Compact and easily installed. Write for Catalog 24.

SPRAYING SYSTEMS CO. 3216 Randolph St. • Bellwood, Ill.

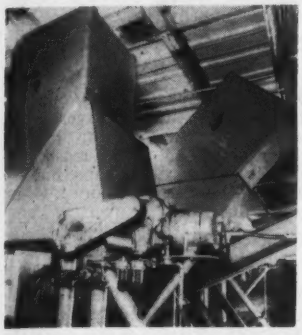
FOR EASIER SPRAY NOZZLE INSTALLATION in any type of system . . . see Catalog 24 for Spraying Systems Adjustable Joints . . . and Bulletin 93 for the NEW Spraying Systems Split-Eyelet Connectors.

Check 3033 opposite last page.

Partly-empty bin removable with "dust pan" tilt

Tilting device permits removal of a baffle-equipped bulk container after partial discharge of contents. The mechanism is available with either screw conveyor or gravity discharge hopper.

A partially empty bin is removed by lowering the tilting device back to a level position

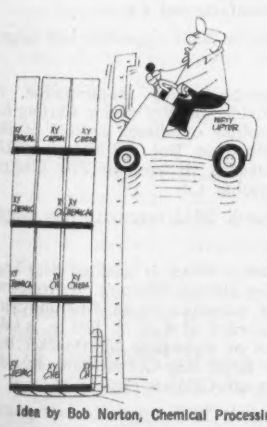


Partly-empty bin can be seen being lowered (at right) preparatory to being removed from tilting device

so that the product flows out beneath the baffle within the bin to its natural angle of repose, holding the remainder in the bin. The screw conveyor removes the material remaining in the hopper and the bin door may then be shut and sealed.

(Dust Pan Tilt is a development of the Tote System, Inc., Beatrice, Neb.)

Check 3034 opposite last page.



Idea by Bob Norton, Chemical Processing

GENERAL AMERICAN AIRSLIDE® CARS ...NOW MORE THAN 4500 IN SERVICE!

918 BUILT AND DELIVERED IN 1960 Demand for these highly efficient cars is big . . . and steadily growing. Introduced only 6 years ago, the AIRSLIDE car's reputation for safe, bulk shipment and speedy unloading has now made this car the standard for granulated and powdered materials. It is especially desirable for those materials which tend to bridge or pack or which do not normally flow by gravity.

HOW AIRSLIDE CARS HAVE BEEN RECEIVED BY INDUSTRY *Here are some of the commodities Airslide Cars are handling: Flour (Wheat, Oat, Semolina, Soya), Sugar (Beet, Cane, Corn), Starch, Chemicals, Plastic Powders, Weed Killers, Activated Carbon, Bentonite, Clay (phosphatic), Ores.*

If you are not already taking advantage of AIRSLIDE CARS, it will pay you to get complete data. Write today to:

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GENERAL AMERICAN TRANSPORTATION CORPORATION

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Offices in principal cities

AIRSLIDE GENERAL AMERICAN TRADE MARK

Check 3035 opposite last page.

How Much Steam Should a Steam Trap Trap?

. . . some answers to commonly asked questions about the primary job of a steam trap

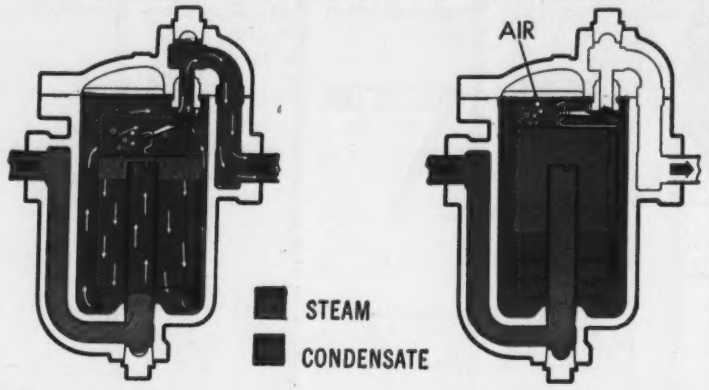
You don't need a doctor's degree in thermodynamics to answer the question at the top of this page. Naturally, a steam trap should trap *all* the steam.

Unfortunately for you, the problem isn't quite that simple. After all, a shut off valve would trap all the steam . . . and condensate, and air, and carbon dioxide as well.

So we'd better amend the answer to the question this way: A steam trap should trap *all* the steam but *must* remove condensate, air and carbon dioxide as rapidly as they accumulate.

With this established, let's take a closer look at what's involved:

HERE'S THE STEAM TRAP DESIGN THAT GETS RID OF CONDENSATE AND AIR WITHOUT STEAM LOSS



Trap open. Condensate entering trap has caused bucket to lose buoyancy. Weight of bucket times leverage pulls valve open. Air is discharged along with condensate.

Trap closed. Steam has floated inverted bucket; valve is held tightly closed by system pressure. Air entering trap passes through bucket vent and accumulates at top of trap.

A Steam Trap Should Trap All The Steam

If you've had experience with several different makes of traps, you already know that some trap steam better than others. The operating principle of the trap is what makes the difference. We like to talk about it because Armstrong traps are designed so that no steam can get to the orifice. The valve is always water sealed. Result: *More efficient steam utilization, lower fuel costs.*

A Steam Trap Should Remove Condensate

All traps remove condensate—after a fashion. For maximum efficiency in the unit being drained, though, the trick is to get it out without waiting for it to cool and without leaking steam.

Armstrong's water sealed valve takes care of steam leakage. The inverted bucket operating principle opens the trap for water regardless of its temperature. This means you get the condensate out as quickly as it accumulates. Result: *Higher temperatures and better heat transfer in steam heated units.*

A Steam Trap Should Remove Air and CO_2

Part and parcel of the condensate removal problem is removal of air as well as oxygen and carbon dioxide—two real troublemakers. Air tends to reduce operating temperatures and interfere with heat transfer. CO_2 goes into solution to form corrosive carbonic acid which, for example, can eat unit heater tubes. O_2 aggravates the situation. Believe it or not, but all traps don't properly remove air and CO_2.

By now, you've probably guessed that Armstrong traps *do* remove air and CO_2. Armstrong design (see illustration) provides continuous venting of air and CO_2. By opening suddenly, the Armstrong trap creates a momentary pressure drop to "pump" the air down to be vented. Result: *Higher temperatures, faster heat-up, better heat transfer and reduced corrosion.*

Note: When required, specially sized air vents are furnished. For fast heat-up of low pressure on-and-off units, Armstrong provides open float and thermostatic air vent traps.

What's the Final Answer?

Summing it all up, you'll get the best service from steam heated units that are equipped with traps designed to trap *all* the steam and remove air and condensate as quickly as it accumulates. In our prejudiced viewpoint, this means Armstrong traps. More important are the several thousand users of Armstrong traps who have proved the point.

Before you make up your mind, though, consider the minimum maintenance requirements of Armstrong traps . . . and the convenient assistance your local Armstrong Representative provides. These are important plus values.

Put Up or Shut Up

We're so confident that we "put up". Armstrong traps are unconditionally guaranteed to satisfy. So you can find out for yourself with practically no risk. If you're not completely satisfied with the way they do their job, you can get your money back.

* * *

The 44-page Armstrong Steam Trap book goes into greater detail on these and other Armstrong features. It also discusses trap selection, installation and maintenance. Ask your Armstrong Representative for a copy or write

Armstrong Machine Works
8806 Maple Street
Three Rivers, Michigan

ARMSTRONG STEAM TRAPS

813-ST

"See our catalog in Chemical Engineering Catalog"

Check 3036 opposite last page.

NEW LITERATURE

Material Handling and Packaging

Floor trucks, designed to fill a wide range of individual requirements, are described in 16-page booklet which features model number and selection suffix chart to simplify ordering. Cat 135 — Hamilton Caster & Mfg. Co.

Check 3037 opposite last page.

Storage and transport tanks and how they are manufactured is the subject of 20-page Walker Brochure — Walker Stainless Equipment Company, Inc.

Check 3038 opposite last page.

Diverse cellophane types, currently available to packagers, are covered in booklet with concise descriptions of those most frequently used. Cellophane Bul — E. I. du Pont de Nemours & Company, Inc.

Check 3039 opposite last page.

Conveyor belts, fabricated of rubber, are detailed and operating advantages cited in Cat M5 — Manhattan Rubber Division, Raybestos-Manhattan, Inc.

Check 3040 opposite last page.

Lightweight tanks, thermofusion-molded of high density polyethylene, are covered in comprehensive two-page Thermofusion-Molded Tanks Bul — American Agile Corporation.

Check 3041 opposite last page.

Applications and characteristics of polypropylene packaging film are discussed in four-color brochure which includes inserts of the actual film. Olefane Bul — AviSun Corporation.

Check 3042 opposite last page.

Vibrators for bins, ranging in capacity from 2 cu ft to 50 tons, are cataloged in Bul VB-24 — Eriez Manufacturing Co.

Check 3043 opposite last page.

Charger-battery combination to provide standby engine starting for gasoline or diesel engines is described in Bul AR-104 — C&D Batteries, division of The Electric Autolite Co.

Check 3044 opposite last page.

Packer which is credited with bagging 400 to 500 tons of free-flowing materials in an 8-hr day with accuracy of 4 oz ± 100 lb, is subject of eight-page Kraftpacker Bul — Kraft Bag Corporation, subsidiary of Gilman Paper Co.

Check 3045 opposite last page.

Maintenance tips to help . . .

Keep your conveyors moving!

Part I: Belt Conveyors

C. W. CASSELLS and E. J. KAMP
Engineering Field Service Division
Link-Belt Company

Your grease monkeys are high-priced luxuries

The oiler or grease monkey usually has one of the lowest-paid jobs on the labor force. This policy is a high-priced luxury that industry can no longer afford. Modern machinery has outgrown the grease monkey.

It has been our observation that greasers usually fall into one of the following categories:

1) They are older persons given the assignment awaiting retirement.
2) They are not mechanically inclined.
3) Ususally they do not look beyond the assigned task of greasing or oiling.
4) Although frequently asked to make written reports, most greasers are incapable of that task.

We believe that the greaser should be upgraded. Greasing and oiling machinery and equipment should be the responsibility of a first-class mechanic. When he is performing the rather simple job of oiling and greasing, he is in the unique position of being able to recognize impending equipment failure. This man should be a preventive-maintenance detective, who is capable of interpreting unusual sounds, vibrations, smells and other such symptoms.

C. W. CASSELLS
E. J. KAMP

PROPER ALIGNMENT — from head shaft to tail pulley — is the starting point of preventive maintenance on belt conveyors.

Both carrying and return idlers should be level and installed so that long axis of the flat roll is perpendicular to centerline of the belt. Belts of considerable length have been put into operation with only a small adjustment of one or two idlers. Others require correction before they are properly aligned.

Training idlers rather than rigid side-guide idlers should be used for training a belt. The belt edges which bear against these guide idlers frequently are loosened up. They can be worn through to permit entrance of moisture and dirt between plies of the belt. This, along with excessive wear of the belt edges, accelerates belt failure.

It is also a mistake to try to train a belt by increasing tension. This not only strains the driving mechanism, but also places an unnecessary stress on the belt, weakens splices, reduces troughing of the belt (and its carrying capacity), and thus prevents effective training action of the center idler roll.

A belt is either crooked or not centrally loaded when one section runs true and central on the idlers and another runs out of line along all parts of its travel. If the part that runs out is at the splice, it is probable that the splice is not square.

If a belt keeps running out on the same idlers the idlers are out of line. Usually the idlers causing the trouble may be found just behind point where the belt starts out of line. To correct this condition, cant several preceding idlers slightly until the run-out disappears.

Alignment is critical with reversible belts. Where a movable belt-unloading device (such as a tripper) is used, centering and holding of tripper in alignment is also important. The troughing or flat idlers that support the belt should be kept free and turning at all times. Material should not be permitted to build up around the idlers and keep them from turning. This is hard on the rubber belt cover and can cause the belt to run off the idlers.

Loading Sometimes Presents Problems

Loading material on a belt that has been trained empty sometimes creates problems of run-off because of improper loading. In most cases, loading problems are easily overcome. Unfortunately, a chute feeding the belt cannot always be designed to load the belt correctly. For this reason field adjustments may be necessary.

In some cases, center loading can be accomplished by welding a few baffles in the chute to direct flow of material to center of the belt. Oftentimes it is difficult to see or determine just where to place baffles in a chute.

We have, in many cases, put the baffles on a pivot with extended rods to outside of the chute for adjustment. When position is established a permanent correction can be made.

Chute-feeding equipment may be at fault and the loading should be corrected further back in the circuit. The rubber skirts that seal the loading chutes to the belt may need adjustment to prevent material leakage. Skirts that are too tight will eventually wear the belt. In some instances, an additional metal skirt inside the loading chute will prevent leakage of material underneath the skirtboard rubber.

Take the precaution to have the bottom edge on a slight incline up and away from the loading point. This eliminates possibility of having a large piece of conveyed material lodging between the skirt and the belt, with resulting damage to the belt cover.

Keeping Belts Clean

Cleaning difficulties on carrying side of a belt are created by stickiness of some materials. Moisture and dusty materials affect cleaning of belts. Excessive moisture in a material conveyed on a belt has a tendency to be discharged from carrying surface when surface contacts the first return idler away from the head pulley. Sometimes what starts only as a messy condition can become a major problem.

Often the receiving chute is not large or high enough to install additional belt scrapers. In designing for difficult materials, consideration should be given to installing the proper belt cleaners. Unfortunately, a universal belt wiper or cleaner for all cleaning conditions of belts has not been developed. Many corrective steps must be developed in the field to suit the specific problem.

Various methods have been used to clean belts. An air jet close to the belt can assist the original pivoted belt scraper in cleaning a belt surface. A

drip pan is sometimes required under the entire length of the conveyor, with a small amount of water introduced to the pan to keep the spillage moving into a common drain or draining back into the process, so as not to waste the product.

Sometimes a spray of water is applied to the carrying side of the belt as it enters the return run, to clean off the material. When applying water to a belt in this fashion, every precaution should be taken not to get water on the traction or pulley side of the belt to avoid slippage. This can be critical on an inclined belt.

An adhesive material is available that can be applied to a head pulley in most cases without removal of the pulley from the conveyor. In outdoor installation or where there is a possibility of water getting on the pulley side of the belt, a rubber-lagged pulley should be used on the initial installation.

To prevent excessive build-up of any material on the idlers or snub pulleys which can cause the belt to run off, it is sometimes necessary to put steel scrapers on the pulley faces to reduce the build-up to a minimum.

On a conveyor furnished without deck plate between carrying and return run of the belt, risk of a large sharp object getting onto return run is serious. A form of plow should be installed on return run of belt (just ahead of the point where the belt enters the head pulley) to remove

MORE TO COME

This article is the first of a two-part series on maintenance of bulk-material conveying equipment. The second article (in the May CP) will consider preventive maintenance techniques for bucket and flight conveyors. It will also include a check list of facts to tell your supplier so that he can incorporate the best possible preventive maintenance features into the design.

SWENCH®

Manual Impact Wrenches

NOW AVAILABLE IN NEW ½" & ⅝" UTILITY SIZES

Small in size, the all new ½" and ⅝" SWENCH manual impact wrenches are big in power when it comes to loosening tough, small sized "frozen" nuts and bolts.

Like the heavy duty SWENCH wrenches for industrial use, the new ½" and ⅝" sizes apply a tremendous wallop of torsional impact in automotive, light industrial, commercial, and utility use.

Now a completely portable SWENCH can be taken to any job — big or small — for high speed, safe and easy removal of "frozen" nuts and bolts that previously had to be burned off or drilled out. SWENCH wrenches are economical too — they cost far less than other types of impact wrenches and save valuable man hours.

In addition to the new ½" and ⅝" sizes, SWENCH wrenches are available with ¾", 1", 1¼" and 1½" drives. Call your local industrial distributor today for a demonstration or write to:

Don't wrench it - SWENCH IT!

CURTISS WRIGHT
MARQUETTE DIVISION
1145 Galewood Drive, Cleveland 10, Ohio

AD HD 33-4

Check 3046 opposite last page.

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Rating of Company .....

Street Address .....

City ..... Zone No. ..... State .....

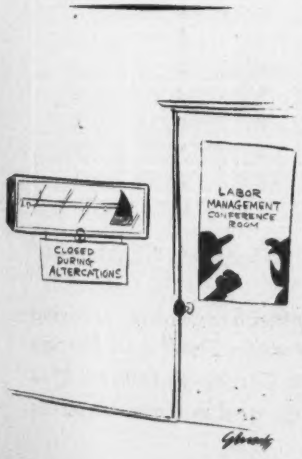
any material that could cause such damage.

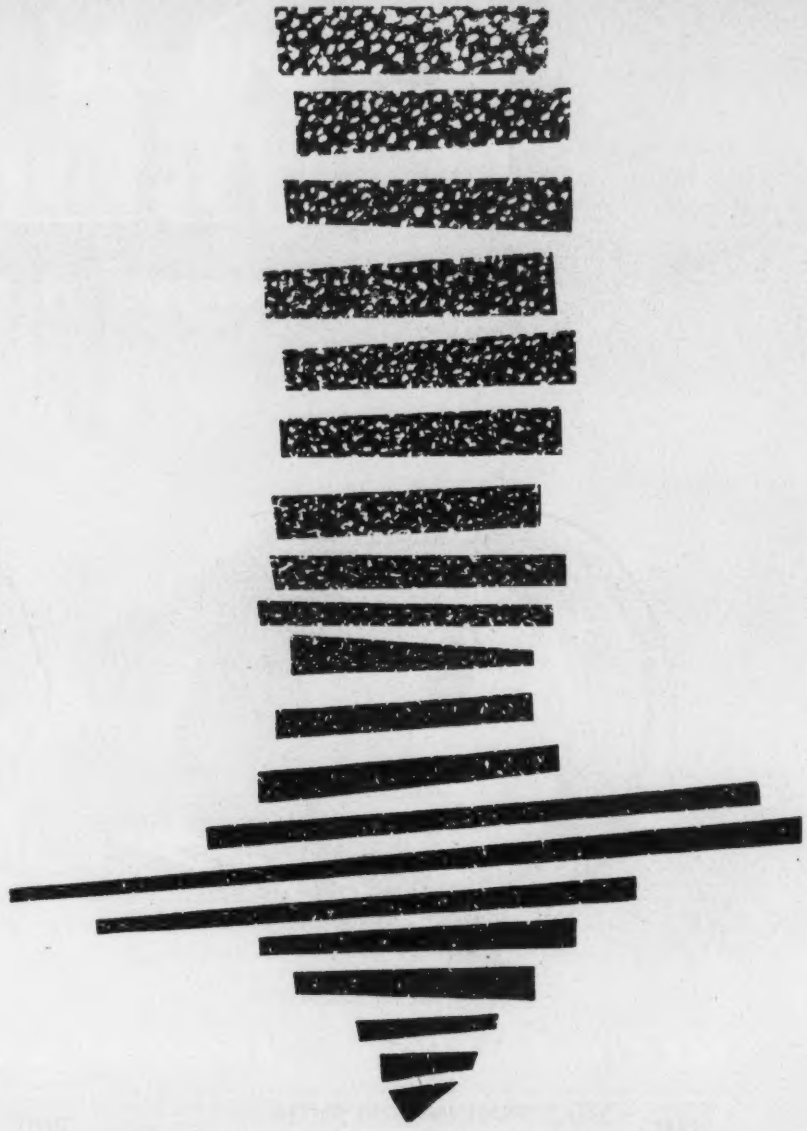
A few beater idlers on the return run can sometimes dislodge sticky material from belts and thus keep remainder of the return idlers clean. In an emergency, beater idlers can be made from a standard return idler and ⅝ to ¾" diameter round bars — welded to end bells after center section of idler has been removed. The bars should be spaced to produce solid rapping effect on the belt.

If large lumps are being loaded upon a belt, it is suggested that impact idlers be used to cushion fall of lumps onto the belt. Such idlers will withstand the shock or impact much better than the conventional troughing idler. Impact idlers will also contribute to longer belt life.

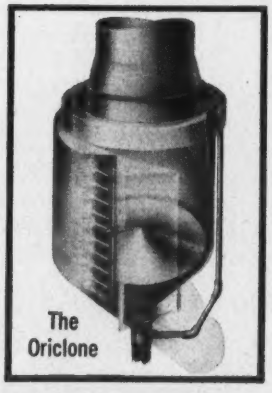
In cases where fines are also available with lumps, it is always good practice to provide a screen, or grizzly, in bottom of the chute to permit fines to drop upon the belt before lumps. The layer of fines on the belt will not only provide additional cushion for the large lumps, but also will prevent cutting of the belt covering by sharp edges of lumps.

(Based on the paper, "Maintenance of Bulk Material Conveying Equipment," presented by C. W. Cassells and E. J. Kamp before the ASME Maintenance and Plant Engineers Division Conference in St. Louis on April 25, 1960.)





exploring the Sub-Micronosphere

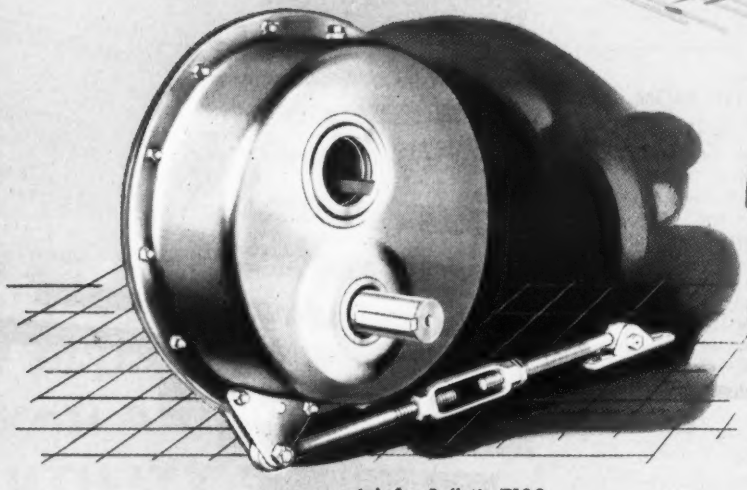


The Sub-Micronosphere is the mystifying and challenging province of the small dust and fume particle, the "Submicron," which never exceeds 1/25,000" in size. Submicrons are elusive, wily and extremely difficult to capture... unless you use the right technique. Conquerors of the Sub-Micronosphere have found the Ducon Oriclone Scrubber to be a most effective weapon. It has captured Submicrons by the millions. The Oriclone is a new type of high energy scrubber... smaller... more economical... yet more effective than other units. It is the ideal collector for fine dusts and fumes.

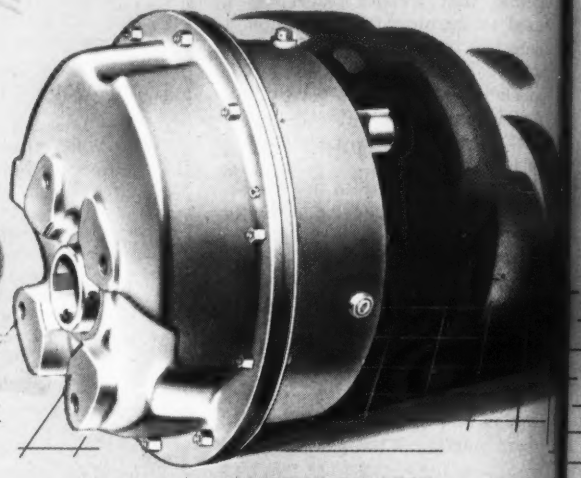
Ask for Bulletin W-8560 and learn more about the Oriclone.

THE Ducon COMPANY Inc.
147 EAST SECOND STREET • MINEOLA, L. I., NEW YORK
CYCLONES • CENTRIFUGAL WASH COLLECTORS • TUBULAR CLOTH FILTERS • DUST VALVES
Canadian Branch:
THE DUCON COMPANY, of CANADA, Ltd., 1181 Petit St., BURLINGTON, ONTARIO, CANADA

Check 3047 opposite last page.



Ask for Bulletin 7100



Ask for Bulletin 7100

147 COMBINATIONS . . . horizontal or vertical applications . . . . .

UNIT SIZE	SHAFT MOUNTED DRIVES					
	RATIOS			MOTOR MOUNT	OVERLOAD RELEASE	BACK-STOP
	4	14	24*			
107J	X	X	X	X	X	X
115J	X	X	X	X	X	X
203J	X	X	X	X	X	X
207J	X	X	X	X	X	X
215J	X	X	X	X	X	X
307J	X	X	X	X	X	X
315J	X	X	X	X	X	X
407J		X	X	X	X	X
415J		X	X	X	X	X
507J		X	X	X	X	X

½ to 125 hp. Up to 100,000 lb-in. torque

UNIT SIZE	FLANGE MOUNTED DRIVES					
	RATIOS				BACK-STOP	MOTOR MOUNT
	4	9	14	24*		
107J	X	X	X	X	X	X
115J	X	X	X	X	X	X
203J	X	X	X	X	X	X
207J	X	X	X	X	X	X
215J	X	X	X	X	X	X
307J	X	X	X	X	X	X
315J	X		X	X	X	X
407J			X	X	X	X
415J			X	X	X	X
507J			X	X	X	X

*20:1 ratio for sizes 107 and 115

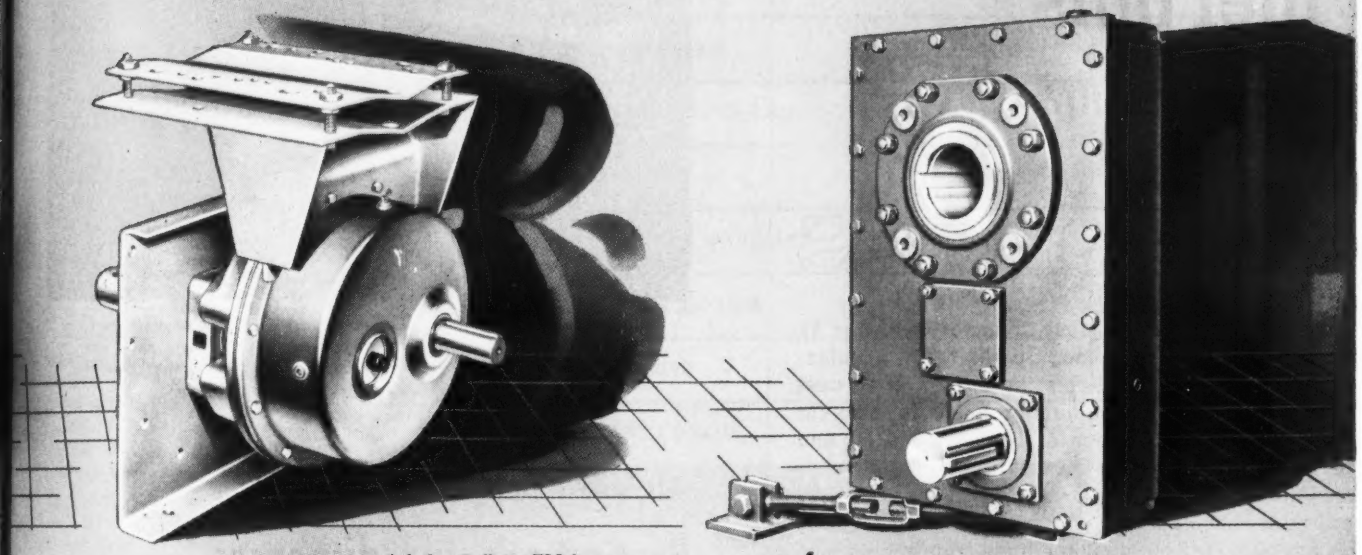
½ to 125 hp. Up to 100,000 lb-in.

Exclusively FALK . . . ***Adaptability of all these three types of Falk Drives for use with Equi-Poised Motor Mount.*** **This feature reduces costs of engineering and constructing motor bases and foundations.**

Exclusively FALK . . . ***Interchangeable rotating elements*** **size-for-size between Shaft and Flange Mounted Drives or Screw Conveyor Drives. This feature simplifies stocking and maintenance for large users.**

. . the most complete line of SHAFT MOUNTED, FLANGE MOUNTED and SCREW CONVEYOR drives . . .

The line with the exclusive EQUI-POISED motor mount



Ask for Bulletin 7106

. . . . AVAILABLE FROM STOCK

UNIT SIZE	SCREW CONVEYOR DRIVES				
	RATIOS				MOTOR MOUNT
	4	9	14	24*	
107J	X	X	X	X	X
115J	X	X	X	X	X
203J	X	X	X	X	X
207J	X	X	X	X	X
215J	X	X	X	X	X
307J	X	X	X	X	X
315J	X		X	X	X
407J			X	X	X
415J					
507J					

½ to 40 hp. Up to 44,000 lb-in. torque

Exclusively **FALK**... ***Single helical gears*** **used in *all* sizes and types—they provide maximum (98½%) efficiency per gear mesh.**

FALK is a registered trademark

New 2 LARGER SIZES OF SHAFT MOUNTED DRIVES – 415-507

Falk-designed and Falk-built for higher torque requirements, these all-steel, *helical* gear reducers are available in Shaft and Flange Mounted Drive design.

TWO RATIOS, 15:1 and 25:1
HORSEPOWER RATINGS TO 125
TORQUE RATINGS TO 100,000 LB-IN.

Ask for **Bulletin 7100.1 (Shaft and Flange Mounted Drives) or for Bulletin 7106.1 (Screw Conveyor Drives).**

THE FALK CORPORATION
MILWAUKEE 1, WISCONSIN

Manufacturers of Quality Gear Drives and Flexible Shaft Couplings

Representatives and Distributors in most principal cities

A POINT TO PONDER.. **when you need gear drives or shaft couplings of "FALK OR EQUAL" quality, where but from Falk can you get the "OR EQUAL"?**

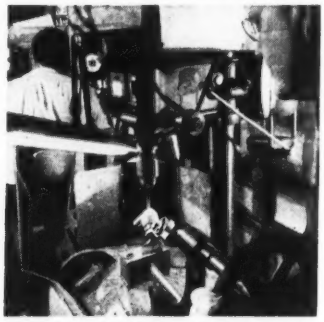
For more information on product at left, specify 3048 see information request blank opposite last page.

dust control with 25% savings in fuel bills for Dr. Grabow

A demonstration of WHEELABRATOR'S

VITAL VALUES

A Wheelabrator Dustube cloth tube type Dust Collector ventilates all dust-creating operations at Sparta Pipes, Inc., Sparta, N.C., manufacturer of Dr. Grabow Pre-Smoked Pipes. Replacing an old, open dust bin, the control system not only solved the dust problem, but also cut fuel bills at least 25% through recirculation of heated clean air, and reduced building maintenance costs 15%. The high filtration efficiency of the Wheelabrator Dustube is just one example of the many Vital Values incorporated in all Wheelabrator systems which bring bonus benefits and multiple savings. For your dust and fume control problems investigate Wheelabrator. Write for bulletin 372 D.



Three floors of manufacturing operations are ventilated by a Dustube Dust Collector that has brought 5-way savings to Sparta Pipes, Inc.

VITAL VALUES FOR INDUSTRY

WHEELABRATOR DUST AND FUME CONTROL

WHEELABRATOR CORPORATION, 478 S. Byrkit St., Mishawaka, Ind.
In Canada, WHEELABRATOR CORP. of Canada, Ltd. P.O. Box 490, Scarborough, Ont.

Check 3049 opposite last page.

In pumping unit (left), two reactive materials are proportioned, filtered, and passed to dispensing head (right) where they are intimately mixed and released through minute orifice that creates fine material break-up for spray applications

Air-powered system . . .

Proportions and dispenses two-component reactive agents without atomizing air

Uses: Exact proportioning, mixing and dispensing of two-component chemically reactive materials.

Features: Unit is completely sealed. Use of airless hydraulic atomization precludes possibility of contamination of pumped agents by moisture and other impurities. Compressed air is the sole source of power.

Description: System consists of proportioning pump and mixing and dispensing gun.

An air-operated (at 20 to 120 psi) straight-reciprocating positive-displacement unit pumps the two materials, proportions them in exact ratio, filters them, and powers their transfer through separate flexible hoses to a light-weight dispensing head. The materials are then pre-blended, homogenized into a final initimate mix and applied by spray or flow while subject to instantaneous purging at any moment.

The two reactive materials are fed to the proportioning pump through a manifold casting. This directs one material to the center lower pump and the other to the two outside lower pumps. The use of three such pumps gives the system balanced mechanical loading.

Proportion ratios (accurate to within ± 1%) are obtained by controlling the cylinder size of the two outside lower pumps in relation to that of the center. Thirteen mix ratios are available.

Material fed into outside pumps is pumped through exterior tube into common material-outlet manifold in base of air motor. Manifold is equipped with material pressure gage and built-in overload-relief valve. Material fed into center unit is similarly directed to a second outlet manifold.

Transfer—From outlet manifolds, materials are forced through edge-type permanent filters, through dispensing hoses, and into gun.

Pump will stall out against pressure. This insures instantaneous control. It also eliminates need for auxiliary control circuits, bypasses or power-engagement devices.

Mixing is initiated within blending chamber of gun. It is accomplished under high-pressure with a static labyrinth-type unit. Stainless-steel check valves located at each end of the static mixer allow material to flow freely through the mixer, but check any reverse flow to prevent possible intermix and back-up in transfer hoses.

Intimate mixing and dispensing—At moment of dispensing, materials are homogenized. Blended materials are then forced through small orifice at high pressure without use of atomizing air. This hydraulic atomization helps keep overspray at a minimum.

Tungsten-carbide spray tips are available in fan patterns of 4 to 20". Material purity is retained through use of 50-mesh screen filters at each material inlet.

Solvent flushing—A 5:1 air-powered pump is utilized for solvent flushing of gun. Since only ½" of preblended material is contained within gun, flushing is not wasteful.

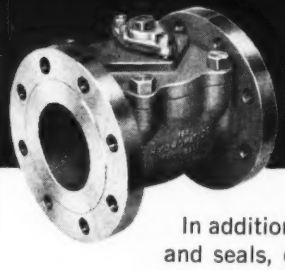
(Hydra-Cat proportioning system and mixing and dispensing gun are product of Gray Company, Inc., Minneapolis 13, Minn.)

Check 3050 opposite last page.

How to buy a ball valve!

Check these features!

	FLO • BALL	VALVE A	VALVE B	VALVE C	VALVE D	VALVE E
1. TOP ENTRY	√			√		
2. IN-LINE MAINTENANCE	√			√	√	
3. TOP AND BOTTOM GUIDED BALL	√					
4. DOUBLE SEATS	√	√	√	√	√	√
5. FLANGES INTEGRAL WITH BODY	√	√		√		
6. ONE-PIECE BALL AND STEM	√					
7. BLOCK AND BLEED	√					
8. COMPETITIVELY PRICED	√	√	√		√	√



Only FLO·BALL has all 8

In addition to these outstanding features, the **FLO•BALL** valve, with all teflon seats and seals, offers all of these advantages which make it far superior to other types of valves: fast ¼ turn, minimum pressure drop, leakproof shut-off, visible on-off indication, no backlash, and the lowest torque of any valve. The **FLO•BALL** can never stick or freeze, and it lasts longer, with less maintenance, than any other valve made.

HYDROMATICS offers the most complete line of industrial ball valves, including 1" through 14" flanged, 150#, 300# and 600#, all built to ASA dimensions. Also available: ⅛"—2" screwed end valves to 3000#.

HYDROMATICS is the world's most experienced ball valve manufacturer, having built ball valves to 10,000 psi and 14". See your local distributor for details and prices, or write to:

Hydromatics, Inc.

BLOOMFIELD, N. J. • PILGRIM 8-7000 • TWX = BLOOMFIELD, N. J. 120

FLO-BALL

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Check 3051 opposite last page.

WHO SWIPED PAGE 61

D'ja ever pick up a copy of CHEMICAL PROCESSING with an article torn out . . . or even worse, HALF an article torn out?

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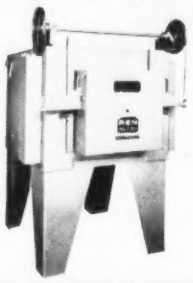
SOLVE HEAT-TREATMENT PROBLEMS

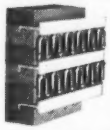
for Glass, Steel, Aluminum, Ceramics, Chemical Processing

ONLY TRENT BOX TYPE FURNACES offer these performance advantages:



- Controlled, Uniform Clean Heat to 2300°F.
- Operate from Standard Voltages
- Standard Switches and Controls
- Require No Transformers
- TRENT "Folded and Formed" Electric Heating Element

THE HEATING ELEMENT MAKES THE DIFFERENCE!



Surface of continuous "Folded and Formed" ribbon type element faces the work chamber—gives up to *4 times the radiating area* per given cross section of ordinary types! Let TRENT engineers study your needs to determine the efficient and economical solution to your heating problems.

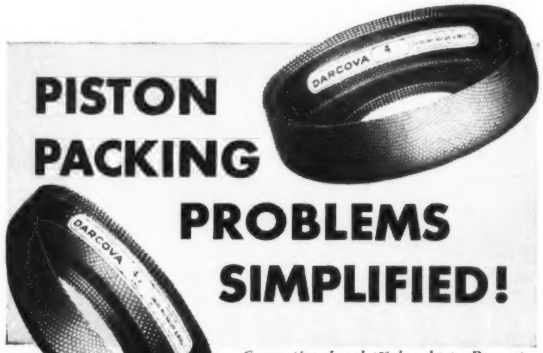
Write for Bulletin 75-TD

TRENT INC.
Electrically Heated Industrial Equipment

235 Leverington Ave., Philadelphia 27, Pa.
In Canada
Pioneer Electric Eastern Ltd., Toronto

Check 3180 opposite last page.

PISTON PACKING PROBLEMS SIMPLIFIED!



Conventional and 45° bevel type Pumcups.

• The *right* piston packing for reciprocating pumps and cylinders goes a long way toward eliminating the problems of slippage, maintenance and down-time.

Because Darcova Pumcups are made in a complete range of sizes, various types, and in many texture-engineered compositions, they *fit* your temperature-pressure-fluid conditions. That's one important reason why they usually outlast other packing at least 3 to 1 while holding top efficiency to the last!

Why not get *all* the facts? Send today for Bulletin No. 5903.

DARCOVA
THE ORIGINAL COMPOSITION CUP

DARLING VALVE & MANUFACTURING CO.
Williamsport 4, Pa.

TRADE MARK
PUMCUPS

Check 3181 opposite last page.

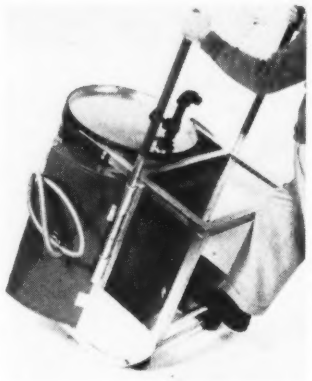
Horizontal position used in heating drum contents

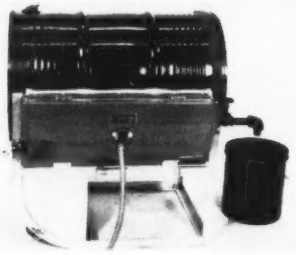
Uses: Heating drums of heavy or viscous materials.

Features: Warmer has semi-cylindrical heating unit which cradles drum horizontally. As lowered to horizontal position, it provides gravity drainage and eliminates need for complex pumping equipment.

Description: Warm drummers are equipped with removable handles and 4" wheels for easy tilting and maneuvering. Web belt holds drum in place. They are designed to accommodate standard 55-gal drums, and offered in choice of two thermostatically-controlled temperature ranges: −60 to +250°F or 100 to 450° F. They are available in models for connection to 115, 208, 230 and 460 v single or three-phase systems.

(T-H drum warmer is product of Harold L. Palmer Company, Farmington, Mich.)





Drum warmer features semi-cylindrical heating unit which cradles drum horizontally. In this manner drum is lowered to horizontal position to provide gravity drainage, eliminating need for complex pump equipment

Check 3053 opposite last page.

NEW PORTABLE PROPELLAIR®

TUBEAXIAL FANS with FLEXIBLE DUCT

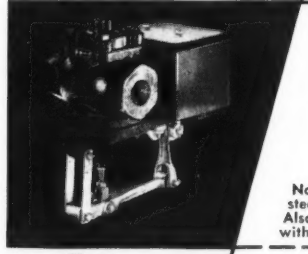
WRITE: PROPELLAIR DIV.
ROBBINS & MYERS, INC.
SPRINGFIELD, OHIO

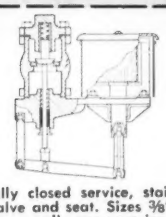
Check 3192 opposite last page.

BIG LINE-UP BIG PERFORMANCE

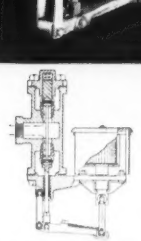
Johnson Solenoid Valves are built for heavy duty service . . . handling, air, water, steam, heavy viscous liquids. No pilots or pistons; powerful leverage design opens smaller valves against 250 lbs. Because of the remoteness of the solenoid, temperatures up to 400° F. are easily handled without adverse effect on the solenoid coil. Bodies are bolted together. Explosion-proof models also.

JOHNSON Direct Operated SOLENOID VALVES

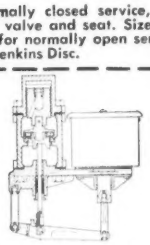




Normally closed service, stainless steel valve and seat. Sizes ⅜"-3". Also for normally open service, and with Jenkins Disc.



3-way valve. Stainless steel valves and seats. Sizes ½"-1½".



Dashpot construction, cushions closing to avoid water hammer. Jenkins Disc. Sizes ¾"-2".

Write for Bulletin "V"

THE JOHNSON CORPORATION
826 Wood St., Three Rivers, Mich.

Check 3193 opposite last page.

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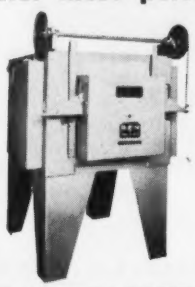

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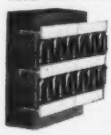

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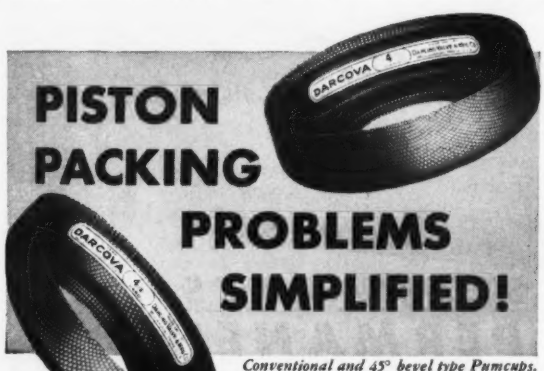

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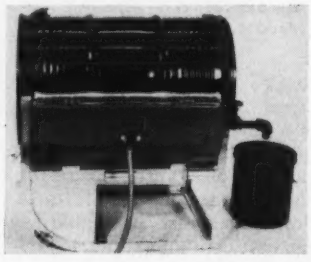

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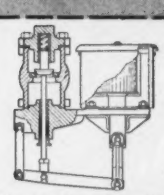
WRITE: PROPELLAIR DIV.
ROBBINS & MYERS, INC.
SPRINGFIELD, OHIO

Check 3192 opposite last page.

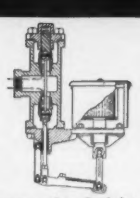
BIG LINE-UP BIG PERFORMANCE

Johnson Solenoid Valves are built for heavy duty service . . . handling, air, water, steam, heavy viscous liquids. No pilots or pistons; powerful leverage design opens smaller valves against 250 lbs. Because of the remoteness of the solenoid, temperatures up to 400° F. are easily handled without adverse effect on the solenoid coil. Bodies are bolted together. Explosion-proof models also.

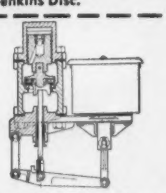
JOHNSON Direct Operated SOLENOID VALVES



Normally closed service, stainless steel valve and seat. Sizes ⅜"-3". Also for normally open service, and with Jenkins Disc.



3-way valve. Stainless steel valves and seats. Sizes ½"-1½".



Dashpot construction, cushions closing to avoid water hammer. Jenkins Disc. Sizes ¾"-2".

Write for Bulletin "V"

THE JOHNSON CORPORATION
826 Wood St., Three Rivers, Mich.

Check 3193 opposite last page.

ADVANCE PNEUMATIC
EYE-BATH BOTTLE

ALWAYS IMMEDIATELY ACCESSIBLE FOR FLUSHING DANGEROUS SUBSTANCES FROM THE EYE

For flushing chemicals or foreign matter. Simple to clean, unbreakable and easy to use in any position. Can be kept right on the person and in accessible places around the plant.

PATENT PENDING

ADVANCE SEAMLESS
FINGER GUARDS
PATENTED

PREVENTS FINGER CUTS
PROTECTS FINGERS ALREADY CUT

- Worn comfortably over light bandage
- Shields finger from painful contact
- Does not render finger useless in the manner of heavy bandages
- Easily removed to allow washing of hands and easily replaced
- Open and closed-end models
- Absorbent cotton lining
- One size fits all fingers, men & ladies

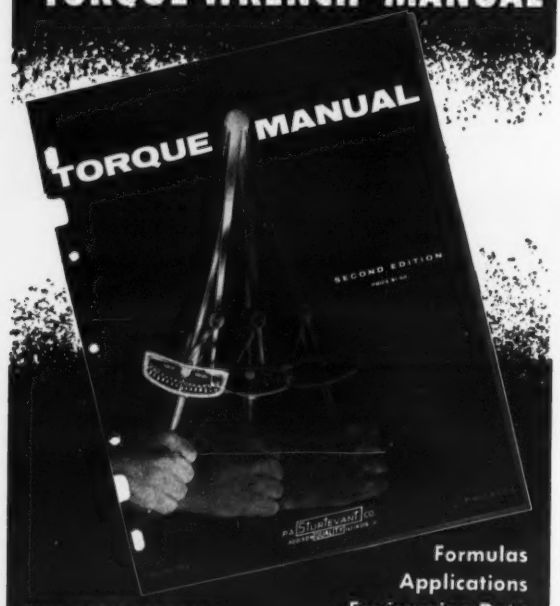
PLANTS IN . . .
DETROIT
CHICAGO
TOLEDO
ROME, GEORGIA

Write for free catalog

ADVANCE GLOVE MFG. CO.
918 W. LAFAYETTE BLVD.. DETROIT 26, MICHIGAN

Check 3054 opposite last page.

"TORQUE WRENCH" MANUAL



Formulas
Applications
Engineering Data
Screw Torque Data
Adapter Problems
General Principles

SENT UPON REQUEST

PA STURTEVANT CO.
ADDISON QUALITY ILLINOIS

Manufacturers of over 85% of the torque wrenches used in industry

Check 3055 opposite last page.

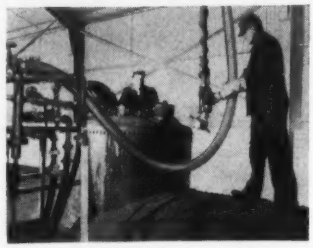
▶ A NEW SOLUTIONS ARTICLE

Tank-car turn-around time reduced by jet cleaners by as much as 89%

Contamination protection vital for product quality

Problem: Cleaning-out tank cars was a time-consuming, 48- 72-hr operation for Rohm & Haas Co. at their Bridesburg (Philadelphia) plant.

Procedure involved 1) draining tank car of any remaining resins, 2) filling car with 6 to 10,000 gal of water, 3) adding cleaning compound (caustic or acid, depending upon which type of resin had been in car), 4) introducing steam into car to provide heat and agitation, 5) draining completely, 6) flushing and draining several times prior to sending men into hand-dry interior.



Use of hydraulic rotary cleaners to clean tank cars has reduced number of cars necessary by slashing tank-car turn-around time

Cars are used for shipping variety of synthetic resins, plasticizers and chemicals. Products must be guarded against contamination to insure uniformity of performance.

Solution: Hydraulic jet rotary cleaners were employed in company's tank-car cleaning station. Air-operated heads use water at 100 psi supplied by circulating pump. During cleaning cycle, tank car is first drained of any remaining resin. Then cleaning head is lowered into car — its two nozzles rotating in both vertical and horizontal planes.

Supplementing scrubbing action of jets is detergent action of acid or caustic cleaning compound mixed with 180°F water. After scrubbing, clean

FOR ABSOLUTE LABORATORY UNIFORMITY . . .

THE *Marion* MIXER
. . . IS STILL THE LEADER

FOR MIXING:

- Dry and Semi-Wet Chemical Powders
- Agricultural Chemicals
- Materials for the Plastics Industry
- Soaps, Detergents and Sanitation Chemicals
- Sweeping Compounds
- Pharmaceuticals
- Fertilizers

A uniform mix is assured time after time, no matter how complicated the formula, and with laboratory exactness. If the formula is right —the MARION MIXER will mix it with complete accuracy.

THE EXCLUSIVE MARION MIXING and BLENDING ACTION will handle any type of chemical materials and give a top quality mixed product at less cost.

Send Today For Free Descriptive Literature

RAPIDS MACHINERY COMPANY
865 11th Street Marion, Iowa

Check 3056 opposite last page.

STOPS LEAKS
PERMANENTLY:
prove it at our expense!

Use *Leak Lock* to seal thread and flange joints...to keep bolts, nuts and plugs from loosening under the most rigorous usage. It's been job-proved in thousands of applications to give these advantages...

- Withstands solvents that eat away other joint compounds.
- Remains flexible indefinitely ...joints won't freeze.
- Gives a tight seal under a wide range of temperatures, pressures.
- Does *not* heat spontaneously.
- Is unaffected by oil, gasoline, refrigerants, most gases and chemicals.
- Makes work easier... flows on and stays where applied.

Listed by Underwriters' Laboratories for gas, oil, propane and butane equipment.

FREE SAMPLE—*Leak Lock* is available in handy tubes and in cans. Write on your letterhead for sample tube.

HIGHSIDE CHEMICALS INCORPORATED
16 Colfax Avenue • Clifton, New Jersey

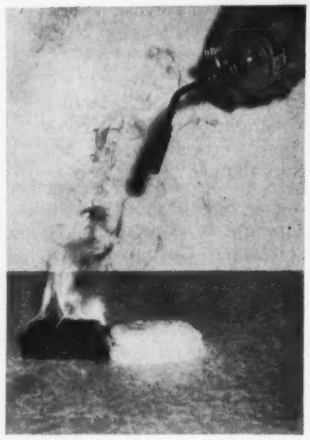
Check 3057 opposite last page.

water is flushed into tank using same jets. Finally, men enter tank car to dry by hand.

Results: Employees can now clean a tank car in eight hours. As a result, tank-car turnaround time has been reduced by factor of as much as 89%. It has permitted Rohm & Haas to lessen number of cars necessary for shipment. Similar units are now in use at company's Houston, Texas, and Knoxville, Tennessee, plants.

(Hydraulic rotary cleaners are product of Sellers Injector Corporation, 1636 Hamilton St., Philadelphia 7, Pa.)

Check 3058 opposite last page.



'Slip by' flames

. . . through use of grease which is guaranteed to not burn. Product reportedly will not carbonize, corrode, or melt under heavy loads.

(No-flame grease is product of Bel-Ray Company, Inc., Farmingdale, N.J.)

Check 3059 opposite last page.

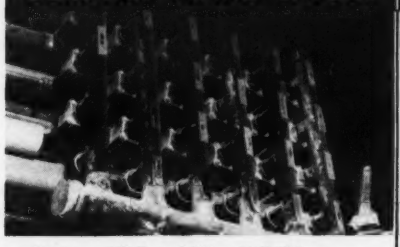
NEXT MONTH

Visitors at Esso Standard's Baton Rouge, Louisiana, plant are likely to be startled by the sight of driverless trailers running about. They are used by the stores department to send a variety of maintenance and service supplies throughout the plant. Find out how they do it in this section next month.

ILLUSTRATED:
1". SIZE
SIZE RANGE:
¼" TO 6"

THE
ECON-O-MISER
BALL VALVE

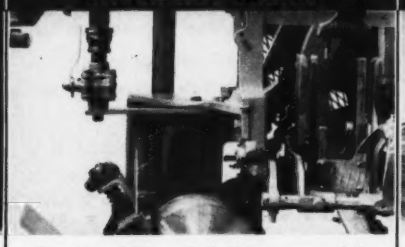
COMPACT PIPING LAYOUT



Here are 19 Econ-O-Miser Ball Valves compactly installed on this paint blending manifold. Note the absence of unions . . . this valve is both a valve and a union! The Econ-O-Miser is smaller, easier to install . . . just right for modern piping layouts, where equipment must fit into tight areas.

Let us show you . . . in your own plant! Write us about your limited space problems!

DIFFICULT MEDIA



The Econ-O-Miser Ball Valve successfully controls the flow of cold glue with a viscosity of molasses, on the WORLD Tandem Labeler manufactured by Economic Machinery Co. Clean wiping action, positive leakproof shut-off, and smooth round flow, make the Econ-O-Miser ideal for handling difficult media.

Let us show you . . . in your own plant! Write us about your media problems!

TROUBLE-FREE OPERATION

Outdoor propane and butane storage tanks in remote field processing plants require dependable positive shut-off valves on bleed lines. The unique features of the Econ-O-Miser Ball Valve provided the practical answer . . . no lubrication . . . no metal-to-metal contact . . . quick visual ON-OFF indication . . . trouble-free service.

Let us show you . . . on your outdoor applications! Write us about your valve maintenance problems!

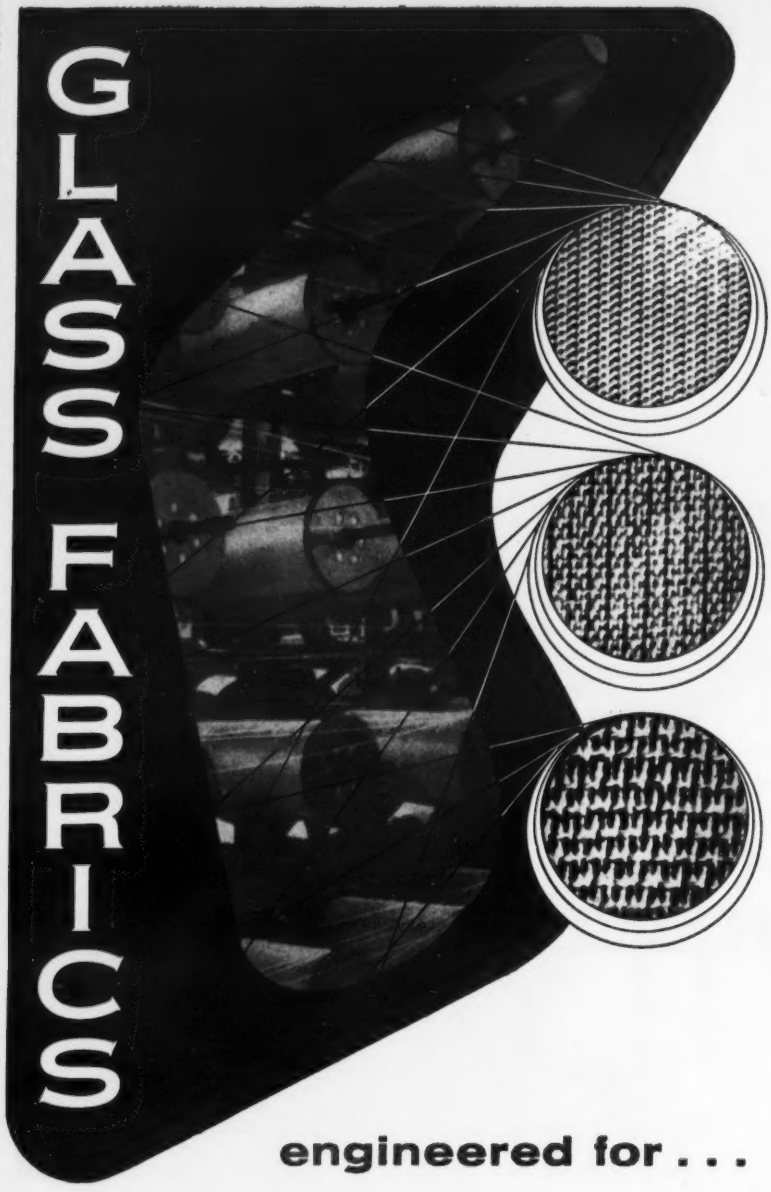
COMPARE . . . THE ECON-O-MISER BALL VALVE

NO UNION NECESSARY

WORCESTER VALVE CO., INC.

16 PARKER STREET, WORCESTER, MASS.

Check 3060 opposite last page.



engineered for . . .

•LIQUID FILTRATION •PLASTICS LAMINATION

•HIGH TEMPERATURE DUST COLLECTION •INSULATION

Tell us your application, we will send you samples

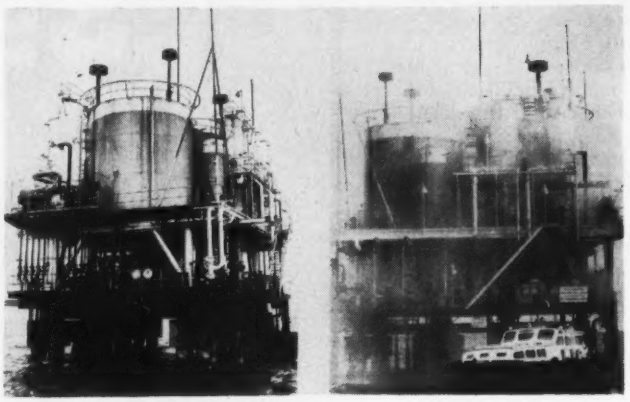
Weavers of Industrial Filter Media for over Fifty Years

NFM NATIONAL FILTER MEDIA *Corporation*

General Offices and Mills: New Haven 14, Conn.; Western Office and Factory: Salt Lake City 10, Utah, Sales Offices—Representatives: Atlanta, Ga., 990 Lindridge, N.E.; Cleveland 39, Ohio, P.O. Box 9407; Alhambra (L. A. Area), California, 20 South 1st St.; Chicago, Ill., 6034 N. Cicero Avenue; Maquinaria Minera e Industrial, S.A., Mexico, D. F., Apartado #215; Houston, Texas, 1607 Jefferson Avenue; Toronto, Ontario, C.P.R. Roadway, 1119 Yonge Street.

Check 3061 opposite last page.

▸ A NEW SOLUTIONS ARTICLE



Automatic fire protection . . .

. . . for this $1 million flow station, of the San Jacinto Oil Company on Venezuela's Lake Maracaibo, is provided by sprinkler system. Station collects 50,000 bbl/day of crude oil from 20 wells located beneath 100'-deep lake. Installation test is shown in photo at right.

One-hundred forty-six nozzles are located in strategic areas in maze of pipe and tanks. These are set-off when slightest fire is detected by rate-of-rise heat-actuated devices located throughout station. These trip release which starts flow of nitrogen from pressure cylinder.

Gas is then propelled through air motor, starting diesel engine which drives 1500-gpm vertical-turbine fire pump at 100 psi.

(Fire-Fog Sprinkler system is development of Automatic Sprinkler Corporation of America, Youngstown, Ohio.)

Check 3062 opposite last page.

"Oh no! That's just our motto here in maintenance."

Chemical Boobytraps

Unsuspected Hazards Awaiting the Unwary

Hooker H_2S blast serves grim warning

Failure of a 2" diameter pipe nipple below 5000-gal sodium sulfide outdoor storage tank at Hooker Chemical Corporation's Niagara Falls, N.Y., plant, resulted in death of two men and temporary hospitalization of a number of others.

The men inhaled concentrated H_2S gas, formed by reaction of sodium-sulfide liquid pouring onto ground, contacting acid and generating gas.

H_2S gases is insidious, partly because it is colorless and partly because in heavy concentration (as in this case) the rotten-egg odor may be undetected. Paralysis of the olfactory nerves takes place extremely quickly with no warning symptoms.

Hooker officials stated that some of the tank's contents had been transferred to a process making an automotive gear oil additive. Line was then being emptied to prevent freeze-up — a normal cold-weather precaution — when nipple between bottom of tank and valve broke. This left no way to shut off the tank.

Thus entire contents poured on ground below. To neutralize reaction and prevent further gas formation, large quantities of an alkali were quickly added to the spilled chemical. There was no fire and no explosion. Operation of the process was resumed in the afternoon.

Deposited-carbon resistors are subject of study outlining results of performance and reliability test project. More than 20 charts and diagrams are reproduced, illustrating such variables as temperature cycle, short-time overload, terminal strength, dry and wet dielectric strength, moisture resistance and load life. Carbon Resistors Handbook—Burlington Division, International Resistance Company.

Check 3063 opposite last page.

REMEMBER COLLAR BUTTONS?

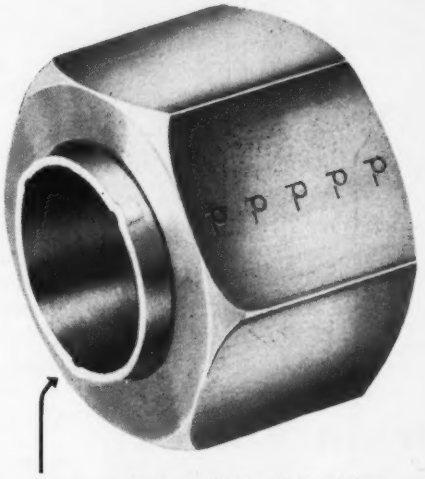
NOW **PARKER** HAS ELIMINATED A MORE SERIOUS ANNOYANCE ...LOST TUBE FITTING FERRULES!

A simple change in the design of Parker "Intru-lok®," the positive, bite-type Parker fitting for copper, aluminum or plastic tubing, has solved an age-old problem.

Small three- and four-piece tube fittings have long been a pain in the neck on applications where it is necessary to remove the nut from the fitting. The ferrule(s) fall out and promptly disappear. If and when found, they often get put in backwards. Sometimes they never get put back at all. Result, in either case: a leaking joint.

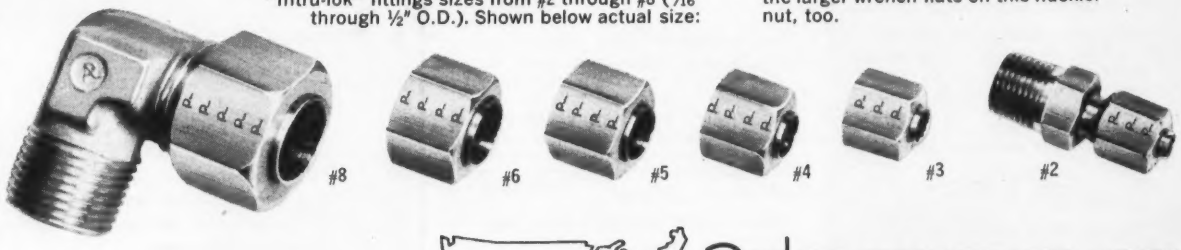
Now Parker has developed a snap-in, captive ferrule for "Intru-lok." You can take it out of the nut, "on purpose," but you can't drop it out accidentally.

You get all the leakproof safety of a three-piece fitting with positive "bite." You also get the convenience, the quick, easy assembly of a two-piece fitting. The easiest fitting to install has been made even easier. Write for new "Intru-lok" dimensions and prices today.



Three "detents" hold the "tail" of the new ferrule in the nut. Also, the larger hole in the nut makes tube bends closer to the fitting possible. Note the larger wrench flats on this huskier nut, too.

The new nut with captive ferrule is available on all "Intru-lok" fittings sizes from #2 through #8 (1/16" through 1/2" O.D.). Shown below actual size:



PARKER HANNIFIN CORPORATION

Parker FITTINGS AND HOSE DIVISION

17325 Euclid Avenue • Cleveland 12, Ohio

PNEUMATIC AND HYDRAULIC SYSTEM COMPONENTS

3278-PH

EUROPEAN DIVISION • PARKER-HANNIFIN N.V. • SCHIPHOL • THE NETHERLANDS

Check 3064 opposite last page.

a
FLUSH BOTTOM VALVE
that
WILL NOT CLOG UP!

Designed for Chemical and Pharmaceutical Industries

Strahman

RAM TYPE
Drain Valves

The Strahman Drain Valve is the only valve that cannot clog up. It is so designed that in the closed position the piston or ram extends up into the tank thus preventing any possibility of the outlet becoming plugged.

In the open position, full and unobstructed flow is assured as the piston is drawn down into the bonnet leaving a completely open passage for the material passing through.

Write direct for complete catalogue

STRAHMAN
VALVES, INC.
NICOLET AVE., FLORHAM PARK, N. J.

Check 3065 opposite last page.

ENGINEERING & SAFETY

Drawing-board surface 'repairs itself'

Recently developed drawing-board surface material incorporates unusual self-repairing feature.

It consists of layer of Mylar laminated to layer of green vinyl plastic. Backed with adhesive, surface remains flat to reduce tendency of some coverings creep, wrinkle or stretch. Surface keeps instruments from sliding, and at same time heals itself of impressions of pencil lines, grooves and compass holes. It can be cleaned with mild agents.

(Paramount drawing board surfaces is product of Keuffel & Esser Co., 3rd and Adams St., Hoboken, N.J.)

Check 3066 opposite last page.

NEW LITERATURE
Plant Engineering, Safety and Fluids Handling

Epoxy applications in repair, maintenance and new construction are considered in six-page Bul SEC 759 — Sika Chemical Corporation.

Check 3067 opposite last page.

Packaged central-station air conditioning units are featured in 60-page product bulletin. Comprehensive treatment makes it possible to select unit, coils, accessories, filters and traps without referring to separate bulletins. Bul AC-100 —Department PD, American Air Filter Company, Inc.

Check 3068 opposite last page.

Float-actuated liquid drainers for discharging liquids from gases under pressure are comprehensively detailed in 12-page bulletin. Capacity and operating pressure data are presented for liquids with specific gravities from 0.40 to 1.00. Bul No. 400—Armstrong Machine Works.

Check 3069 opposite last page.

Rupture-disks dimension standards, venting capacities, gasket sizes, bolt-torque specifications and installation procedures are tabulated in eight-page Rupture Disks Cat—Engineering Department, Falls Industries, Inc.

Check 3070 opposite last page.

KNOX

Your Best Buy in Tower Packings
Know Your Source
Buy Direct from the Manufacturer
- Non-porous
- High Chemical Purity
- Will not crumble
- Uniform Quality
- Great Mechanical Strength

Prices and samples will be sent on request.

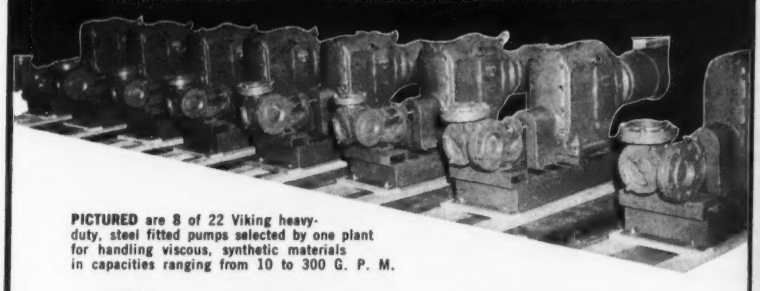
KNOX PORCELAIN CORPORATION
KNOXVILLE 1, TENNESSEE

Always Specify KNOX *Tower Packings*

Check 3071 opposite last page.

PROBLEM: *MOVE VISCOUS LIQUIDS AT 10 TO 300 G.P.M.*

ANSWER: VIKING PUMPS



PICTURED are 8 of 22 Viking heavy-duty, steel fitted pumps selected by one plant for handling viscous, synthetic materials in capacities ranging from 10 to 300 G. P. M.

Viking Pumps answer the problem of moving viscous materials at varying flow rates. Vikings answer many other pumping problems, too, for the line is complete . . . ½ to 1050 G.P.M. So, whether you need a plant full or a single pump—to handle viscous or thin liquids, lubricating or non-lubricating liquids, corrosive or non-corrosive liquids—check Viking for the answer to your problem.

Send today for Catalogs CCC and MCC

VIKING PUMP COMPANY

50 YEARS

Cedar Falls, Iowa, U.S.A. In Canada, it's "Roto-King" Pumps
See Our Unit In Chemical Engineering Catalog

Check 3072 opposite last page.

Storage water heaters, 55 sizes in both vertical and horizontal models, are covered in eight-page bulletin. ASME construction of tanks and elements, alloys available for special fabrications and various clads and linings available are also described. Bul 61—Niagara Weldments, Inc.

Check 3073 opposite last page.

Temperature conversion chart permits rapid, accurate conversion from any scale . . . Kelvin, Rankin, Centrigrade or Fahrenheit . . . to any other scale. Chart is printed on both sides of 8 x 11 sheet. Bul 10605 — Rosemount Engineering Company.

Check 3074 opposite last page.

Rotary-screw pumps for applications ranging from petroleum to viscous and fire-resistant fluids are discussed in 42-page illustrated bulletin. A selection guide, specifications, performance data and other general information are included. "IMO Pumps"—De Laval Steam Turbine Company.

Check 3075 opposite last page.

Precious metal electrical contacts, their applications and selection criteria, are subject of technical bulletin which includes other articles on thermocouple materials and abstracts of recently issued U.S. patents concerning precious metals. "Precious Metal Electrical Contacts" — Engelhard Industries, Inc.

Check 3076 opposite last page.

Flame-plated coatings are covered in series of bulletins which present up-to-date physical data and characteristics. Data is included on compositions, physical constants, chemical properties and applications. "Flameplated coatings bulletins"—Linde Company, Division of Union Carbide Corporation.

Check 3077 opposite last page.

Boiler and pressure vessel code (Section VIII ASME) has been presented in handy wall-chart form for quick reference. It provides direct reference to the Code rules applied to specific construction features. "Quick Reference Guide to ASME Boiler and Pressure Vessel Code"—Missouri Boiler and Tank Company.

Check 3078 opposite last page.

For more information on development reported in this section, check corresponding numbers on Reader Service Slip opposite last page of this issue.

YARWAY news briefs

from **Yarnall-Waring Company,** *Philadelphia 18, Pa.*

BRANCH OFFICES IN 19 UNITED STATES CITIES • SALES REPRESENTATIVES THROUGHOUT THE WORLD
STEAM TRAPS STOCKED AND SOLD BY 270 LOCAL INDUSTRIAL DISTRIBUTORS

The whole works—steam trap, strainer and blow-down valve—fit in the palm of your hand

ENTHUSIASTIC APPROVAL!

INDUSTRY WELCOMES NEW SERIES 130 IMPULSE STEAM TRAP WITH OPEN ARMS

"Radically new and different—send 50."
TEXAS INDUSTRIAL

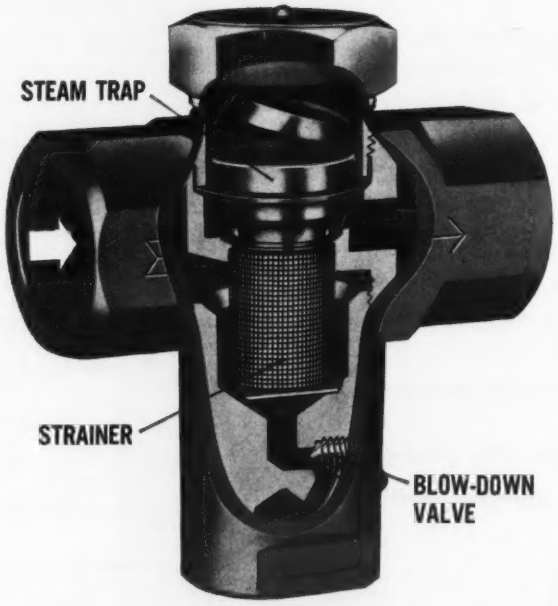
"We want 100 immediately. They meet our confined space needs perfectly."
WISCONSIN PACKER

"Ordering 60 as first part of new standardization program."
LOUISIANA REFINERY

"We'll start with 24—more later."
OHIO PETRO-CHEMICAL

So it goes—industry's welcome to the new Yarway Series 130 combination steam trap has been a warm one. Already manufacturing quotas have been doubled to meet the demand. Yarway distributors everywhere are busy answering their customers' requests for demonstrations.

What will the new Series 130 do for you? Consider these advantages:



COMPACT COMBINATION SAVES SPACE, MONEY, MAINTENANCE ON LIGHT LOAD APPLICATIONS

Steam trap, strainer, blow-down valve combination simplifies trapping hook-ups—saves up to 30% in time and materials over ordinary hook-ups.

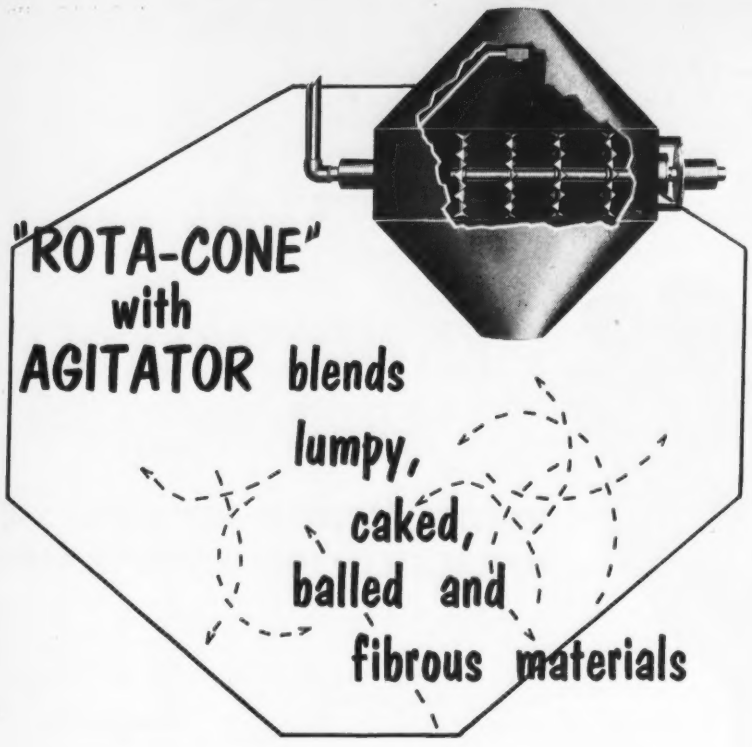
NO OTHER STEAM TRAP COMBINES SUCH COST-SAVING, WORK-SAVING FEATURES

All stainless steel construction, woven stainless steel strainer screen, replaceable trap valve-seat assembly, Allen wrench-operated blow-down valve—make maintenance easy.

Small size, light weight, good for all pressures 8 to 600 psi—make installations simpler.

Try this trap on your steam main drips, steam tracer lines, meter boxes or any other of thousands of light condensate load applications. Call your nearby Yarway distributor today—or write us for more details.

Check 3079 opposite last page.



The Paul O. Abbé "Rota-Cone" Blender, with internal agitator, readily blends lumpy, caked, balled and fibrous materials.

For example, many fine mesh powders become caked into relatively firm lumps. The "Rota-Cone" blender breaks up and restores such caked or lumped materials to their original fineness for blending with other powdered ingredients.

Again where caked powders are treated with a liquid additive, the internal agitator restores the powder to its original fineness, before the atomized spray is added. Breaking, blending and liquids-addition are all accomplished in one unit.

Some materials, tend to form balls while being blended. The internal agitator prevents this "balling" and permits quick, thorough blending.

The "Rota-Cone" Blender produces blended fibrous materials from formulations including tight fibrous clusters which must be opened or fluffed before adding to the batch. It fluffs these clusters and blends—all in one operation—with high degree of efficiency.

Where shortening or other fatty content has to be cut into the powdered materials the "Rota-Cone" produces a perfect blend.
The "Rota-Cone" can help you, too, to solve your difficult blending problem.

For complete details of these Paul O. Abbé machines, write today for our 12-page Brochure "C".

PAUL O. ABBÉ INC

402 CENTER AVENUE LITTLE FALLS, NEW JERSEY

BALL & PEBBLE MILLS • DRY & PASTE MIXERS • DRYERS & BLENDERS

Check 3080 opposite last page.

manufacturers' current literature

This section features a variety of literature currently available from manufacturers. See also the other sections in this issue for new literature pertaining to those particular sections

Chemical Materials

Formaldehyde in alcohols permit larger batch sizes of urea/melamine-formaldehyde resins than are possible with 37% Formalin solutions. Prices and technical data are included in Formcel Solutions Bul—Celanese Chemical Company, Division of Celanese Corporation of America.

Check 3081 opposite last page.

Propylene-glycol's role in polyester-resin production is discussed in bulletin available from Union Carbide Chemicals Company, Division of Union Carbide Corp.

Check 3082 opposite last page.

Chlorinated-rubber's role in concrete-treating compounds is discussed in Parlon Bul—Hercules Powder Company.

Check 3083 opposite last page.

2-Nitropropane ($CH_3CHNO_2CH_3$) has strong solvent power for wide variety of materials including many natural resins, synthetic resins, coating materials, dyes, organic chemicals and fats and oils. Properties are expanded upon in bulletin which may be obtained from Nitroparaffins Department, Commercial Solvents Corporation.

Check 3084 opposite last page.

Dispersants which are non-hygroscopic and free-flowing are specified in Information File W-11—Marathon, Division of American Can Company.

Check 3085 opposite last page.

"Chemicals for Industry" is title of brochure available from General Chemical Division, Allied Chemical Corporation.

Check 3086 opposite last page.

Active oxygen chemicals, including urea peroxide, sodium carbonate peroxide, sodium perborate, calcium peroxide, magnesium peroxide and zinc peroxide, are taken up in Bul 1—Becco Chemical Division, Food Machinery and Chemical Corporation.

Check 3087 opposite last page.

Expoxidation and hydroxylation with hydrogen peroxide and peracetic acid is subject of Bul 69—Becco Chemical Division, Food Machinery and Chemical Corp.

Check 3088 opposite last page.

Silicone defoamers are considered in Foam Control Manual—Dow Corning Corporation.

Check 3089 opposite last page.

Hydrogen peroxide (2), 35% H_2O_2 (high-purity) (41), 35% H_2O_2 (for preparing dilute solutions) (42), concentrated H_2O_2 (over 50% concentration) (46), and H_2O_2 (virtually 100% concentration) (70), are topics taken up in Buls 2, 41, 42, 46 and 70—Becco Chemical Division, Food Machinery and Chemical Corporation.

Check 3090 opposite last page.

Separation and Size Reduction

Cutters utilizing shear principle are subject of Giant Cutters Bul—Taylor, Stiles & Company.

Check 3091 opposite last page.

Mulling is subject of 12-page handbook available from Simpson Mix-Muller Division of National Engineering Company.

Check 3092 opposite last page.

For more information on developments in this section, check the Reader Service Slip.

Centrifugal deliquefiers are reviewed in Super-D-Hydrator Bul—The Sharples Corporation.

Check 3093 opposite last page.

Centrifugal air separators classify practically all dry fine materials. Available in range of 60 to 400 mesh, they are topic of Air Separation Booklet—Rubert M. Gay Division, Universal Road Machinery Co.

Check 3094 opposite last page.

Name your service!

ALLOY STEEL SERIES
Working pressures to 10,000 psi.
316 STAINLESS SERIES
Working pressures to 6,000 psi.
416 STAINLESS SERIES
Working pressures to 10,000 psi.
Ask for bulletins covering full line

. . . there's a MARSH NEEDLE VALVE for it

Three great series of needle throttling valves —designed and built as only Marsh experience *in both* valves *and* instruments can make them. In materials for extreme range of services. In a full range of sizes and patterns, including panel mounted. For a wide range of pressures and temperatures.

Body and stem guides machined from solid bar stock for extra strength. Precision ground stems with fine pitched stem-threads for close regulation—tight shut-off. Long lived, but easily replaced "Marpak" moulded packing; Teflon in stainless steel valves. Deep inlet and outlet threads for tight make-up.

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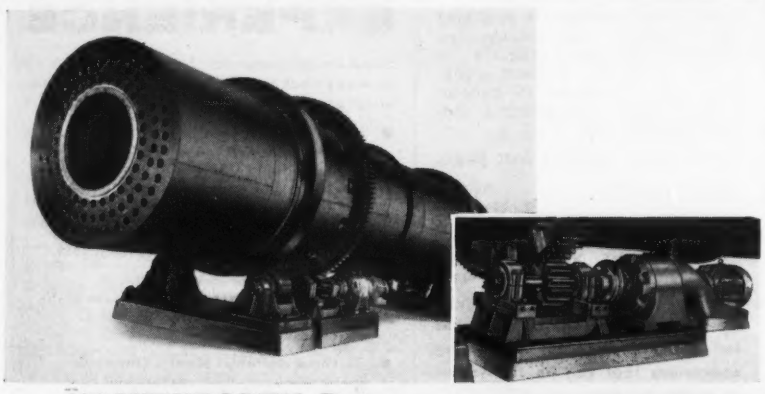
Check 3095 opposite last page.



"DAVENPORT" Rotary Steam Tube Dryer 8'-0" x 45'-0"

Efficient contact drying of many products is required in industry today. "DAVENPORT" Rotary Steam Tube Dryers have been performing this service with unmatched efficiency, accuracy and cost.

Let our engineers consult with you on your Pressing, Drying and Cooling problems or send for our catalog. C. For quick reference consult your Chemical Engineering Catalog.

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PRESSING – DRYING and COOLING Equipment
Continuous DeWatering Presses
ROTARY DRYERS Steam Tube, Hot Air and Direct Fire
Atmospheric DRUM DRYERS
ROTARY COOLERS Water and Air

Check 3096 opposite last page.

CURRENT LITERATURE

Processing polyethylene-film scrap can be accomplished with compact integrated system which produces agglomerates suitable for use by compounders or molders. This pelleting system is discussed in bulletin published by Sprout, Waldron & Co., Inc.

Check 3097 opposite last page.

Pulverizer is used at Southeastern plant to handle calcined alumina. Feed size is 75 microns average, and unit is producing 10,000 to 12,000 lb/hr of end product. Average size is 1 to 5 microns (depending on specification). This and other pulverizers are delineated in Pulverizers Brochure available from Majac, Inc.

Check 3098 opposite last page.

Fluid-energy mills simultaneously with grinding can dehydrate, coat particles, blend and achieve chemical changes. They are indexed in Jet-O-Mizer Mills Bul—Fluid Energy Processing & Equipment Company.

Check 3099 opposite last page.

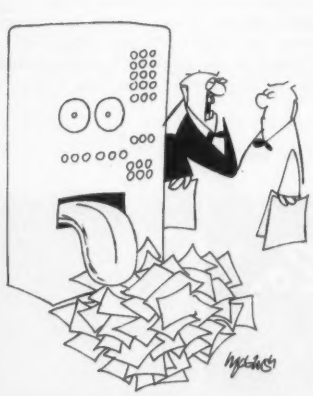
Processing Equipment

Processing equipment of all types is reviewed in publication of Sun Shipbuilding & Dry Dock Company.

Check 3100 opposite last page.

Rotating-disc-contactor columns may be used for liquid-liquid, liquid-solid and liquid-slurry extractions. It is pictured in Bul T-1159—Process Equipment Division—Turbo Mixers, General American Transportation Corporation.

Check 3101 opposite last page.



"You're feeding it too much."

What's News in Milling?

Stainless Steel Morehouse* Mills Protect Against Contamination

Offering all the advantages of the regular "MOREHOUSE" mills — greater production, in less space, at less cost — a complete line of air-cooled and water-cooled stainless steel models are now available.

The line includes ¾ H.P. laboratory mills, 3-5 H.P. pilot plant and R/D mills, 10-20 H.P. medium production mills and 30-50 H.P. big volume mills. All parts that come in contact with materials being processed are type 316 corrosion resistant stainless steel.

The exclusive "MOREHOUSE" principle is based on high speed, attrition-type milling between specially formulated discs. This principle makes possible extremely compact and efficient machines. Dependent on materials being processed, they are capable of producing up to many times the volume per hour of ordinary mills in a fraction of the space and time.

Micrometer hand wheel controls particle size to .001 of an inch. Adjustments can be easily and quickly made while mill is running.

Collet-type lock maintains exact adjustment, preventing any variance in particle size and thereby assuring exact duplication of end products as desired.

Cleaning is simple and easy.

As a result, "MOREHOUSE" stainless steel mills are used throughout the world on hundreds of costly, perishable products where prevention of contamination is important, including chemicals, drugs, pharmaceuticals, and miscellaneous food products. If you have grinding, dispersing, mixing, emulsifying, homogenizing and disintegrating problems involving end products that must be produced contamination free, it will pay you to investigate "MOREHOUSE" mills for greater volume, higher quality and lower power and maintenance costs.

Let us prove it in your plant at our risk!

Write us today about your problem.

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Representatives in Principal Cities. Convenient Lease and Time-Payment Plans

Please send me information on use of MOREHOUSE mills in processing (product)

Name _____ Title _____
Firm _____
Address _____
City _____ Zone _____ State _____
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Check 3102 opposite last page.

SEARCHING FOR SHAPES OF TEFLON?

Here they are . . . by Doré

Sheets, rods, tubes, tape, solid and envelope gaskets, bellows, expansion joints, "O" rings, Vee packing and scores of other shapes of TEFLON* are produced by Doré under the most rigid quality controls. Many exclusive and patented operations are utilized to assure uniform density, freedom of pin holes, dimensional accuracy, and absence of internal stress in TEFLON shapes by Doré. Most of these items are also available in Doré FLUOROGREEN.

Regardless of what your TEFLON requirements may be you will get the best in service . . . the utmost in quality . . . the maximum in performance when you specify shapes of TEFLON by Doré. Write for latest bulletins and data sheets on TEFLON and FLUOROGREEN products by Doré or for engineering assistance on any special problem or application you may have.

SHEETS:
Thickness: 1/32" thru 2"

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Extruded: .200" to 6" dia.

TUBES:
Molded: 2" O.D. to 30" O.D.
Extruded: ¼" I.D. to 2½" I.D.
½" O.D. to 4" OD..

*Registered trademark for Du Pont fluorocarbon resins.

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FLUOROGREEN®
Fluorogreen is a John L. Doré Co. Reg. Trademark

Check 3103 opposite last page.

CURRENT LITERATURE

Mixers which incorporate dual impellers and stationary stators can be powered with motors of 1 to 10 hp. They are tabulated in Bul RL-200—Gabb Special Products Inc.

Check 3104 opposite last page.

Permanent-magnetic ferrous traps have cast one-piece bodies which withstand working pressures to 150 psi. Magnetic element handles materials with temperatures to 850°F in traps which are reviewed in Magnetic Ferrous Traps Bul—Eriez Manufacturing Company.

Check 3105 opposite last page.

Rotary blenders start four-way blending while charging continues during discharge to produce intimate blends within three to five minutes of start of charging. They are further detailed in Bul 080B—Sturtevant Mill Co.

Check 3106 opposite last page.

Decolorizing and purifying corn syrup automatically is job of rotating-leaf pressure filters which were made specifically for the job. This and other process equipment is taken up in catalog available from Goslin-Birmingham Manufacturing Co., Inc.

Check 3107 opposite last page.

Oxygen and nitrogen are produced simultaneously in package-type plants which are available in models which also produce argon. They are considered in bulletin available from Independent Engineering Co., Inc.

Check 3108 opposite last page.

ARE YOU A CARTOONIST?

If so, you can recognize humorous incidents in chemical processing operations that can be turned into profits for you.

CHEMICAL PROCESSING will pay:

$10 for black ink cartoons (with gag lines) on 8½" x 11" sheets — ready to reproduce — payable on acceptance.

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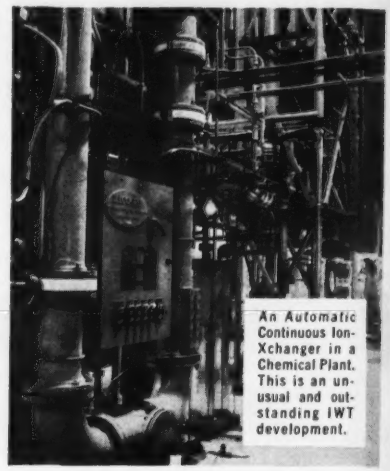

An Automatic Continuous Ion-Xchanger in a Chemical Plant. This is an unusual and outstanding IWT development.

DESIGNED FROM EXPERIENCE

Since ion-exchange has become applicable to so many chemical processes, we have become adept at adapting it. For example:

- To a west coast food processor. Automatic *ion-exclusion* and *ion-exchange* equipment produces USP grade glycerine from saponification crude, without distillation.
- To several midwest corn syrup producers. Automatic equipment for de-ionization. (Our broad experience dates from 1948.)
- To a uranium processing mill. A *continuous* IonXchanger produces high-purity uranium tetrafluoride from yellow cake.
- To three chemical plants. Our equipment removes alkali metals and heavy metals from citric acid, and heavy metals from tartaric acid.

RESEARCH AVAILABLE

Our Research Department, with wide experience and good equipment, has developed many new applications for ion-exchange, and will cooperate on a confidential basis in research and pilot plant work. *Contact us direct, or through our representatives . . .*

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NEW YORK OFFICE: 141 E. 44th St., New York 17, N.Y.
CANADIAN DIST.: Pumps & Softeners, Ltd., London, Ont.

Check 3109 opposite last page.

Processing equipment, including pneumatic materials-handling systems, rotary compressors and vacuum pumps, preheaters, material-level indicators, vane-type and roll feeders, horizontal and inclined-grate coolers, control panels, and preheaters, are reviewed in Processing Equipment Bul—Fuller Company, Subsidiary of General American Transporation Corp.

Check 3110 opposite last page.

Stainless-steel screens are all-welded and have rods spaced by electronic control. Application of these screens to existing equipment is considered in Screens Bul—Bixby-Zimmer Engineering Co.

Check 3111 opposite last page.

Plant Engineering

Woven-wire-screen and wire-cloth applications in grinding, sizing, scalping, dewatering or filtering are reviewed in Bul 160—The Cleveland Wire Cloth & Mfg. Co.

Check 3112 opposite last page.

Oil-mist lubrication system is explained and specified in 48-page Form 37-23—Alemite Division, Stewart-Warner Corporation.

Check 3113 opposite last page.

Industrial lubricating equipment is depicted in 16-page Cat D—Gray Company, Inc.

Check 3114 opposite last page.

For more information on developments reported in this section, check corresponding numbers on Reader Service Slip opposite last page of this issue.

Wire cloth and screens are available woven from any steel, including high-carbon, oil-tempered, stainless and other alloys. Monel, bronze, copper, brass, and other metals are also available materials for wire cloth and screens which are tabulated in reference catalog published by Ludlow-Saylor Wire Cloth Company.

Check 3115 opposite last page.

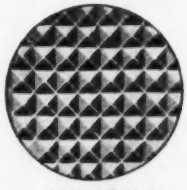
Deionizers, including unit for automatically delivering water in any amount, multi-column unit built in all anion and cation exchanger combinations, and small mixed-bed deionizer version with exchangeable refill to eliminate regeneration, are considered in Buls 512A, H4 and 513, respectively—Elgin Softener Corporation.

Check 3116 opposite last page.

Balanced-Formula NEOPRENE GLOVES

have the safety features that count

EXCLUSIVE! ALSO AVAILABLE WIL-GRIP
Firmhold Finish
Better gripping action in wet *or* dry service



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Greater resistance to oils, greases, petroleum solvents, caustics, many acids, gases and chemicals. Allergen-free, non-irritating to sensitive skin. Curved finger styling adds to comfort, fit, dexterity. Choice of light, medium and heavy weight, smooth or Wil-Gard Firmhold finish.

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The Wil-Gard Neoprene Glove is one of 10 quality lines—70 different styles and compositions—by Wilson Rubber Co. For safety, savings and longer wear, make sure you have the right glove for each specific job. The Wilson Catalog includes convenient selection chart for best performance and protection in 207 different industrial chemicals. Write for your free copy today to get the most value for your glove dollar.

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PREMIER COLLOID MILLS

Where fineness and uniformity of grind are needed, Premier has been a standard throughout the world for almost 40 years.

The Premier Colloid Mill is the simplest in the world. It has only one moving part . . . the rotor. The smooth-faced design makes cleaning easy and quick . . . in most applications only a simple flush at the end of a day's run is needed.

Test samples can be run at no obligation and trial units are available. Write for full information to:

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Check 3118 opposite last page.

H&B ESTABLISHED 1867

JACKETED PIPE and FITTINGS

H&B standard jacketed equipment gives complete jacketing of the product line. Special jigs enable H&B to insure uniformity of the jacket area. Fittings and valves are available in cast or welded construction in all alloys including stainless steel. All H&B jacketed equipment is hydrostatically tested to 450 p.s.i. H&B welded steel jacketed fittings are ideally suited for process piping with pressures reaching 300 p.s.i. and temperatures up to 750°F. . . . For more information send for bulletin J-57.

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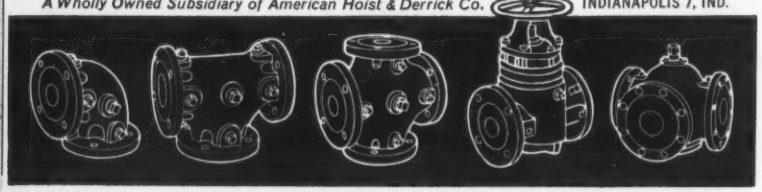
A Wholly Owned Subsidiary of American Hoist & Derrick Co. INDIANAPOLIS 7, IND.



Check 3119 opposite last page.

CURRENT LITERATURE

Gasket materials, including a high grade, long-fiber asbestos unwoven sheet impregnated with Teflon, are specified in Cat P-100—Packing Division, Raybestos-Manhattan, Inc.

Check 3120 opposite last page.

Private trash haulers can put storage containers at convenient locations in plant and empty them mechanically on schedule or on call-in basis. Full details on this service are presented in Private Haulers Bul—Dempster Brothers Inc.

Check 3121 opposite last page.

Chain wrenches are subject of bulletin available from the Ridge Tool Company.

Check 3122 opposite last page.

Air-cooled shaft used on fans preclude need of water, slingers or other circulatory systems to do cooling job. Additional details are included in Bul 960—Garden City Fan & Blower Co.

Check 3123 opposite last page.

Wire cloth and its various applications are reviewed in 120-page Wire Cloth Cat—The Cambridge Wire Cloth Co.

Check 3124 opposite last page.

Rotary positive blowers have capacities in range of 30 to 4000 cfm for pressures to 15 psig (single) and 70 psig (multi-stage). They are detailed in Blowers Bul—M-D Blowers, Inc., Subsidiary of Miehle-Goss-Dexter, Inc.

Check 3125 opposite last page.

"When I discovered he wasn't just another egghead, but owned the company, I decided to catalyze his reaction toward me."

Henry Gaines Goodman, Union Carbide Chemicals

Process equipment problems?
Produces chemical lime with 20% less fuel
Taming Phosphoric Acid Evaporations
Smash TiO_2 down to ¼ micron on teenage hoods
Commercial zone refining makes silicon ultrapure
See the process equipment editorial department

Manual-impact wrenches are available with ½, ⅝, ¾, 1, 1-¼ and 1-½" drives. They are explained in Swench Wrenches Bul—Marquette Division, Curtiss Wright.

Check 3126 opposite last page.

Protective suits and gloves are presented in bulletin published by Jomac Inc.

Check 3127 opposite last page.

Corrosion Control

Hypalon-coating's role in protecting against corrosion is covered in GACO H-2 Hypalon Bul—Gates Engineering Co.

Check 3128 opposite last page.

Heat-proof protective coatings to prevent corrosion, oxidation and carburization are presented in four-page Protective Coatings Bul—Markal Company.

Check 3129 opposite last page.

For more information on developments reported in this section, check corresponding numbers on Reader Service Slip opposite last page of this issue.

Ductile-iron pipe fittings are indexed in bulletin available from the Kuhns Brothers Co.

Check 3130 opposite last page.

Stainless-steel valves are depicted in Aloyco Valves Bul—Alloy Steel Products Company, Inc.

Check 3131 opposite last page.

Glassed-steel characteristics are reviewed in 20-page bulletin incorporating 16 pages of technical data on specifications, thermal shock, operating temperatures, heat transfer, alkali and acid resistance, and corrosion-evaluation facilities. Bul 985—Pfaudler Division, Pfaudler Permutit Incorporated.

Check 3132 opposite last page.

Stainless-steel valves of various types are specified in bulletin available from The Wm. Powell Company.

Check 3133 opposite last page.

Stainless- and alloy-steel valves, fittings and unions are tabulated in 432-page Cat F-10—Henry Vogt Machine Co.

Check 3134 opposite last page.

RAYMOND

Flash Drying

with fine disintegration of material

IN making certain types of powdered products which involve a drying operation, but no pulverizing, the Raymond Cage Mill Flash Drying System gives definite advantages in handling the job.

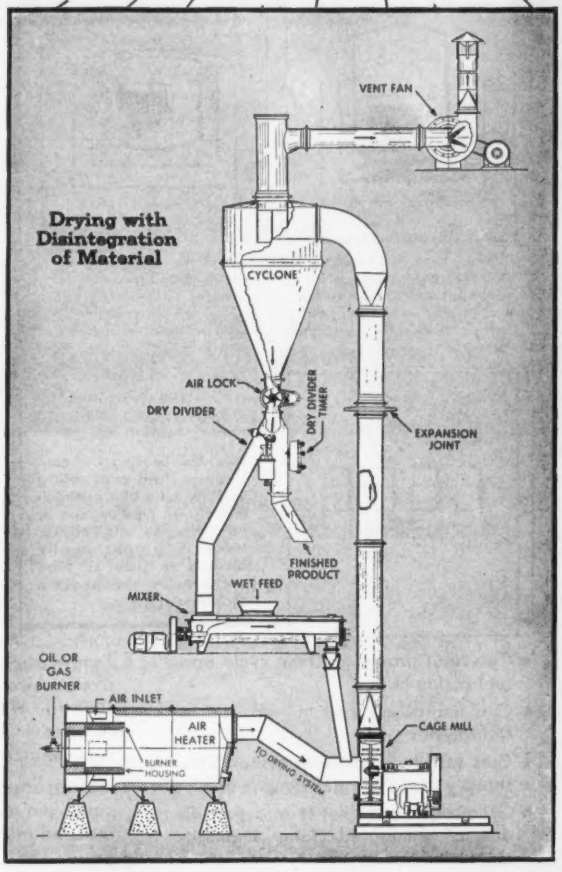
The Cage Mill disintegrates the material to normal particle size and simultaneously reduces the moisture to a specified final content, delivering a fluffy, free-flowing finished material.

Drying is instantaneous, and the small amount of fine material in the system at a time insures close control of the final moisture. This is important in handling heat-sensitive products.

High thermal efficiency plus clean, safe, dust-free, automatic operation are factors that simplify the process and add to the economy of the whole operation.

The system is flexible in application and, where pulverizing is necessary, the Raymond Imp Mill may be used in place of the Cage Mill.

Write for further details and tell us your requirements.



This flow sheet shows a typical set-up for the Raymond Flash Drying System. The Mixer unit is used for adding a portion of the dried material to the wet feed . . . to disperse the moisture and permit efficient drying of the product. For processing treated clays, corn gluten meal, filter cake and similar materials.

COMBUSTION ENGINEERING, INC.

Raymond Division

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CHICAGO 6, ILLINOIS

SALES OFFICES IN PRINCIPAL CITIES

Combustion Engineering-Superheater Ltd., Montreal, Canada

Check 3135 opposite last page.

If it's done with heat . . .

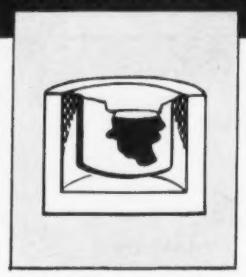
BURDETT *can't be* BEAT!

Esso Standard Oil Co., reports:

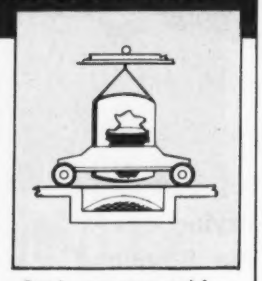
"Although reduction of hot spots and pot burnout was initial reason Esso Standard switched to BURDETT from conventional atmospheric burners, the **most important result** was **cutting soap cooking time to less than half!**"

PRECISION RADIANT HEATING SYSTEMS PIONEERED BY BURDETT

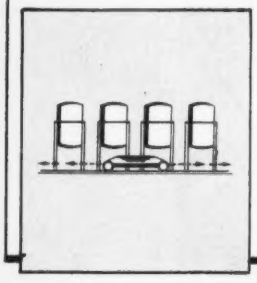
Bottom fired, enclosed stationary processing vessel for oils, soaps, varnishes, etc. NOTE: Intensified heat column is directed towards center.



Side fired, open end stationary melting vessel for metals, salt bath, etc. NOTE: Heat column focused to balance losses at open end.

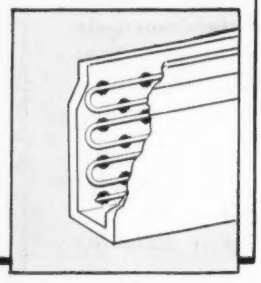


Stationary recessed furnace for portable kettles handled on the floor or overhead.



Portable precision heat system for groups of stationary kettles (left.)

Precision heating for continuous fluid processing used for tube stills of chemical plants, pipe systems of oil refineries, etc. NOTE: Heat is proportionally focused to pipe or tube sections as the process requires (right.)



- Cuts heat processing time cycle and fuel cost in half.
- Cuts manpower cost in half due to short cycles.
- Cuts facility amortization short thru sharply reduced operating costs.
- Greatly prolongs kettle and pot life due to eliminated flame impingements and hot spots.
- Controls the rate of heating closest, adheres to critical temperatures, provides ±2° F precision controls.
- Heat can be focused with different degrees of intensity to offset uneven heat losses.
- Temperature change of the material processed is effected within 15 seconds from fuel input change. Thermal inertia or temperature lag is eliminated.
- Instantaneous push button start—maximum radiation on burner face is reached in 30 seconds.
- Perfect combustion efficiency and wide throttling range.
- "Open application" (without furnace enclosure) can be widely used as there is no flame. Radiant heat pattern is directly focused against the object to be heated.
- Safe, free from hazard, FM and FIA insurable.
- Fully automatic controls for around-the-clock operation without supervision.

Write for details or call **LUdlow 5-1141**

BURDETT MANUFACTURING COMPANY

4920 SOUTH MONITOR AVENUE • CHICAGO 38, ILLINOIS

Check 3136 opposite last page.

CURRENT LITERATURE

Teflon tube connectors are available for laboratory, glassware and equipment applications in sizes to fit 3- to 12-mm glass tube in standard lengths of 1-¾" (with special lengths on request). They are explained in Teflon Tube Connectors Bul—Pennsylvania Fluorocarbon Co., Inc.

Check 3137 opposite last page.

Saran-lined pipe has been in trouble-free operation on 300-ft line for 3 years handling 3% pharmaceutical-grade hydrogen peroxide and deionized water. Such pipe is presented in bulletin of Saran Lined Pipe Company.

Check 3138 opposite last page.

Anti-corrosive wire cloth is available in all widths, measures, and malleable metals. It is covered in Wire Cloth Bul—Newark Wire Cloth Company.

Check 3139 opposite last page.

Long-tangent fittings are fabricated from stainless steel, aluminum, titanium and other special corrosion-resistant alloys. They are fully specified in Corrosion-resistant Fittings Bul—Horace T. Potts Company.

Check 3140 opposite last page.

Tanks linings of modified PVC sheet, Penton, Kel-F, and a depolymerized rubber-end-resin-based thermoplastic (plain or fiberglass reinforced) are subjects of Tank Linings Buls—Plastics and Synthetics Division, U.S. Stoneware.

Check 3141 opposite last page.

Teflon-lined steel pipe is subject of report comparing its installed cost with that of other types of pipe. Fluoroflex Pipe Report—Resistoflex Corporation.

Check 3142 opposite last page.

Rubber hose was used in new plant of Cincinnati Chemical Corporation at Toms River, New Jersey. Full story on applications of this type is contained in Rubber Hose Bul—Manhattan Rubber Division, Raybestos-Manhattan, Inc.

Check 3143 opposite last page.

Pyrex glass pipe and fittings may be used in services at temperatures to 450°F. Additional information is included in Bul PE-3—Corning Glass Works.

Check 3144 opposite last page.

Fiber-glass-fan line includes models for capacities to 34,000 cfm, pressures to 10" static. Additional details are reviewed in Bul FI-511—Air Handling Division, Buffalo Forge Company.

Check 3145 opposite last page.

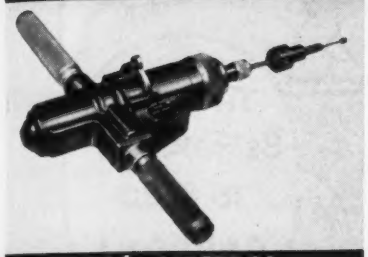
Penton tank linings are subject of data incorporated in Gar-Line Bul—Special Products Department, Garlock Inc.

Check 3146 opposite last page.

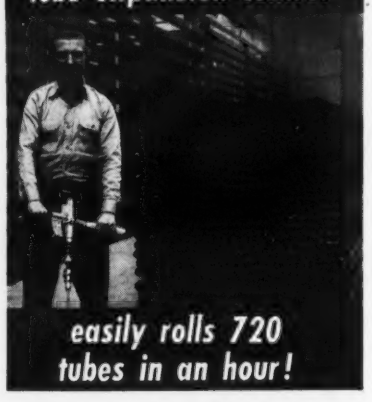
Non-lubricated plug valves with Teflon sleeves for corrosion resistance are tabulated in 16-page Bul V/14—The Duriron Company, Inc.

Check 3147 opposite last page.

"I told you that problem was unsolvable!"



with AIRETROL
tube expansion control



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Check 3148 opposite last page.

CURRENT LITERATURE

Metering corrosive fluids which rotameters such as all-glass transmitting model, is topic discussed in eight-page Bul 150—Brooks Rotameter Company.

Check 3149 opposite last page.

Rotating-shaft mechanical seal incorporates flexible wedge ring and sealing ring molded from Teflon for corrosive applications. It is presented in Mechanical Seal 9 Bul—Crane Packing Company.

Check 3150 opposite last page.

For more information on developments in this section, check the Reader Service Slip.

Lubricated plug valves are available with special coatings to solve variety of corrosion problems. They are detailed in Coated Plug Valves Bul—Rockwell Mfg. Co.

Check 3151 opposite last page.

Process Instrumentation and Laboratory Apparatus

Microbiological devices of all types are reviewed in publication of Scientific and Industrial Department, American Sterilizer.

Check 3152 opposite last page.

Thermocouple assemblies may be used in applications at temperatures between −300 and +2200°F. Line is discussed in Cat E-5—Thermo Electric Co., Inc.

Check 3153 opposite last page.

Flowmeters and accompanying automatic controls are indexed in Bul 48—Buffalo Meter Company, Inc., Subsidiary of American Meter Company.

Check 3154 opposite last page.

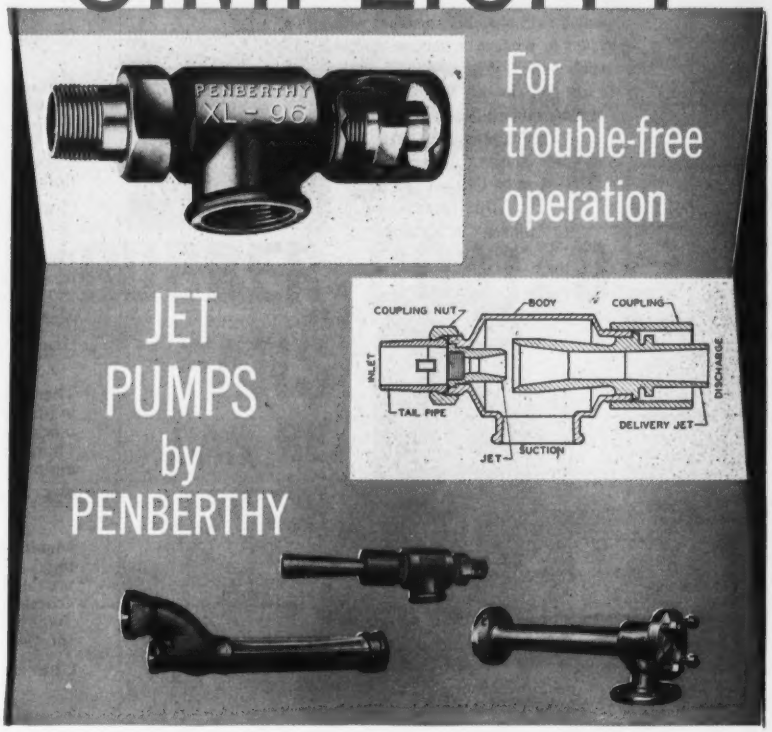
Closed-circuit cuircuit TV systems are explained and discussed in Cat 6-103—Kintel, Division of Cohu Electronics, Inc.

Check 3155 opposite last page.

Liquid meters for automatic control have optional accessories including ticket printers for inventory and cost analysis, impulse contactors for remote registration, and controls to shut off pumps after delivery. They are delved into in Liquid Meters Bul—Rockwell Manufacturing Company.

Check 3156 opposite last page.

SIMPLICITY



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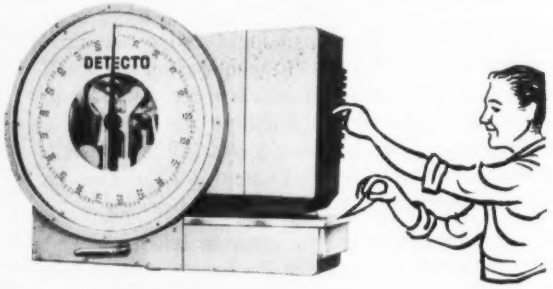
Check 3158 opposite last page.



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Check 3159 opposite last page.

CURRENT LITERATURE

Direct-operated solenoid valves can be used at temperatures to 400°F. They are tabulated in Bul V—The Johnson Corporation.

Check 3160 opposite last page.

Liquid-level gages operate at temperatures from sub-zero to +750° F. Full details are incorporated in Cat 36—Penberthy Manufacturing Company, Division of Buffalo-Eclipse Corporation.

Check 3161 opposite last page.

Tubeless strip-chart recorders are transistorized. Accurate to within ±1%, they are explained in Bul M—West Instrument Corporation.

Check 3162 opposite last page.

Thermometers of dial, recording, industrial and red-reading mercury laboratory types are treated in Thermometers Cat—Palmer Thermometers, Inc.

Check 3163 opposite last page.

Metering pumps each have moving parts submerged in oil. They are available in capacities of few drops to 15.7 gpm, for services to 7000 psig. Cat 59—Lapp Insulator Co., Inc.

Check 3164 opposite last page.

Liquid-level-control line has units of floatless electrode type. They are depicted in 32-page catalog put out by Charles F. Warrick Company.

Check 3165 opposite last page.

Electronic liquid-level controls and associated equipment are subjects of bulletin avaiable from The B/W Controller Corporation.

Check 3166 opposite last page.

Drying and Heating

Fired air heaters may be operated on oil or gas to produce temperatures to 1900°F, flows to 600 lb/sec and pressures to 6000 psig. Direct- and indirect-fired models are presented in Buls 112 and 113, respectively—Thermal Research & Engineering Corp.

Check 3167 opposite last page.

Steam-tube dryers can be supplied fabricated from aluminum, nickel, Monel, Inconel, stainless steels and other alloys to provide protection against corrosion and contamination. They are tabulated in Bul 16-D-13—Hardinge Company, Incorporated.

Check 3168 opposite last page.

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Check 3169 opposite last page.

Heat-exchange panels, for operating pressures to 250 psig, are tabulated in Bul P54—Platecoil Division, Tranter Manufacturing, Incorporated.

Check 3170 opposite last page.

Heat-recovery systems and kiln installations are subjects, respectively, of Buls TKB-3 and 1115—Traylor Engineering & Manufacturing, Division of Fuller Company, Subsidiary of General American Transportation Company.

Check 3171 opposite last page.

Electric heaters are adjustable from 4 to 100% heating capacity by fingertip control. Complete details are included in Bul G62—Edwin L. Wiegand Company.

Check 3172 opposite last page.

Heat-exchanger design and construction materials are reviewed in Bul 949—Pfaudler Division, Pfaudler Permutit Inc.

Check 3173 opposite last page.

Ovens and dryers are available in both batching and conveyor types for services to 1000°F. They are covered in Bul 157—Young Brothers Co.

Check 3174 opposite last page.

Fluids Handling

Joint sealer, which is available in tubes and cans, is specified in Leak Lock Bul—Highside Chemicals Incorporated.

Check 3175 opposite last page.

Flexible couplings are available in standard, flywheel and high speed types. Standard type is stocked in capacities to 2000 hp at 1080 rpm. They are subject of Para-flex Bul—Dodge Manufacturing Corporation.

Check 3176 opposite last page.

Trap strainers, including stainless-steel resin-trap type used for demineralized water at 180 psi in a nuclear power station, are taken up in Bul 601—Multi-Metal Wire Cloth Co., Inc.

Check 3177 opposite last page.

Rotary, gear, centrifugal, and portable pumps; valves; and dispensing valves are considered in All-Chem & Minilab, Gearchem, Centri-Chem, Pumpmobile Gear-Vac, and Chemical Dispsensing Valves Buls, respectively—Eco Engineering Company.

Check 3178 opposite last page.

Couplings and fittings for jointing plain-end pipe are subject of bulletin published by Victaulic Company of America.

Check 3182 opposite last page.

Steam-trap selection and installation are covered in 44-page Steam Trap Book—Armstrong Machine Works.

Check 3183 opposite last page.

Spray nozzles of all types are presented in catalog published by Spray Engineering Company.

Check 3184 opposite last page.

Pump cups for reciprocating pumps and cylinders are produced in conventional and 45° bevel types. More information is included in Bul 5903—Darling Valve & Manufacturing Co.

Check 3185 opposite last page.

Valves

Ball valves and their versatility of application are considered in Ball Valves Bul—Jamesbury Corporation.

Check 3186 opposite last page.

Check valves and cause, effect and control of water hammer are subjects of Buls 654 and 851, respectively—The Williams Gauge Co., Inc.

Check 3187 opposite last page.

Globe and angle valves are forged from stainless or carbon steel for meter and gage-line service. They are explained in Folder GP-9—Henry Vogt Machine Co.

Check 3188 opposite last page.

Top-entry ball valves available in bronze body and Teflon seats and seals are considered in bulletin available from The Lunkenheimer Company.

Check 3189 opposite last page.

Butterfly valves which are resilient-seated each have discs which shut off leak-tight against resilient seat from max line pressure to high vacuum. Line is indexed in Bul 590X—W. S. Rockwell.

Check 3190 opposite last page.

Pinch valves are available in rubber, Neoprene and special compounded-rubber sleeves. They are reviewed in Cat 609—Manufacturing Division, Mine and Smelter Supply Co.

Check 3191 opposite last page.

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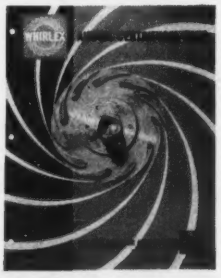

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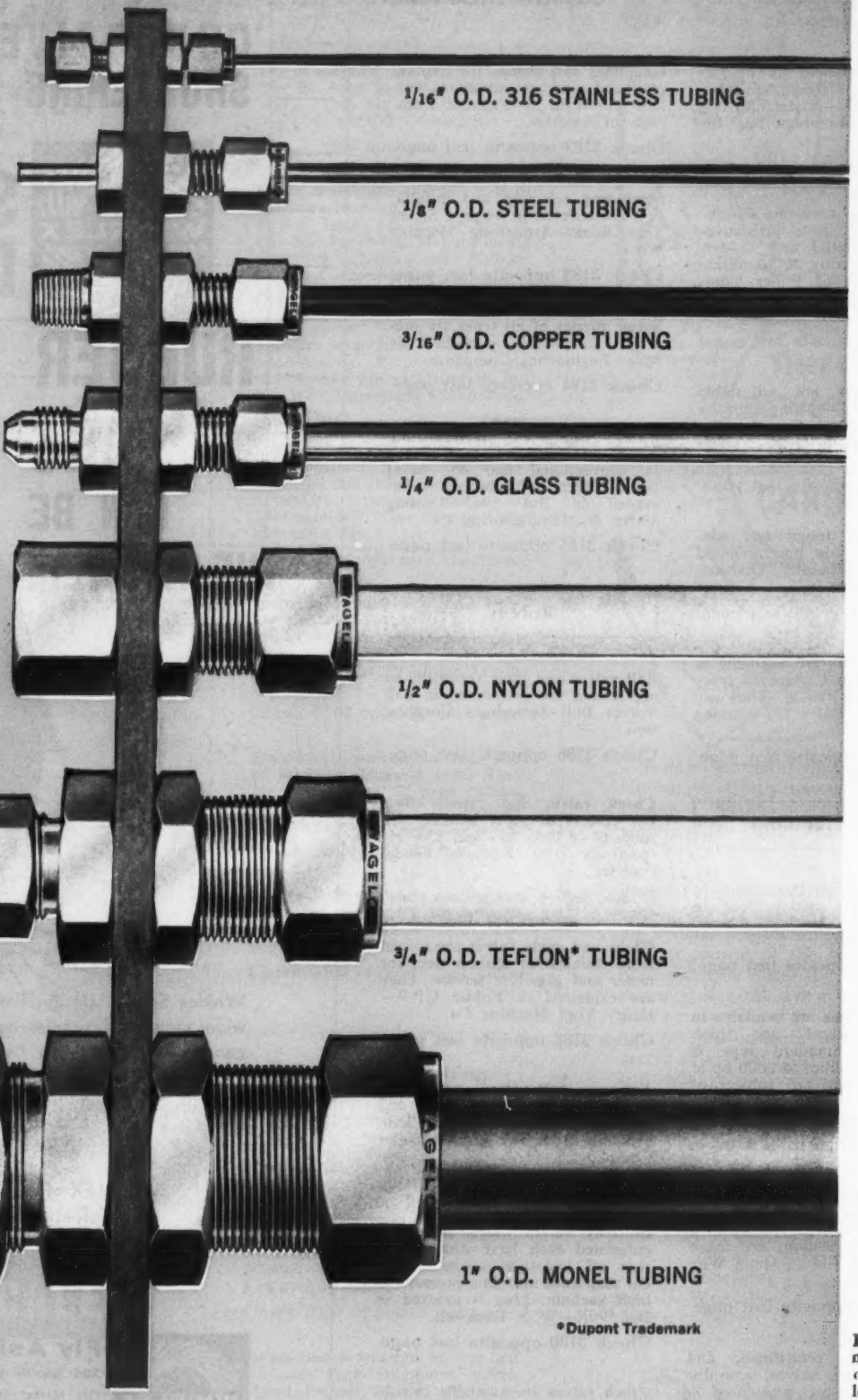
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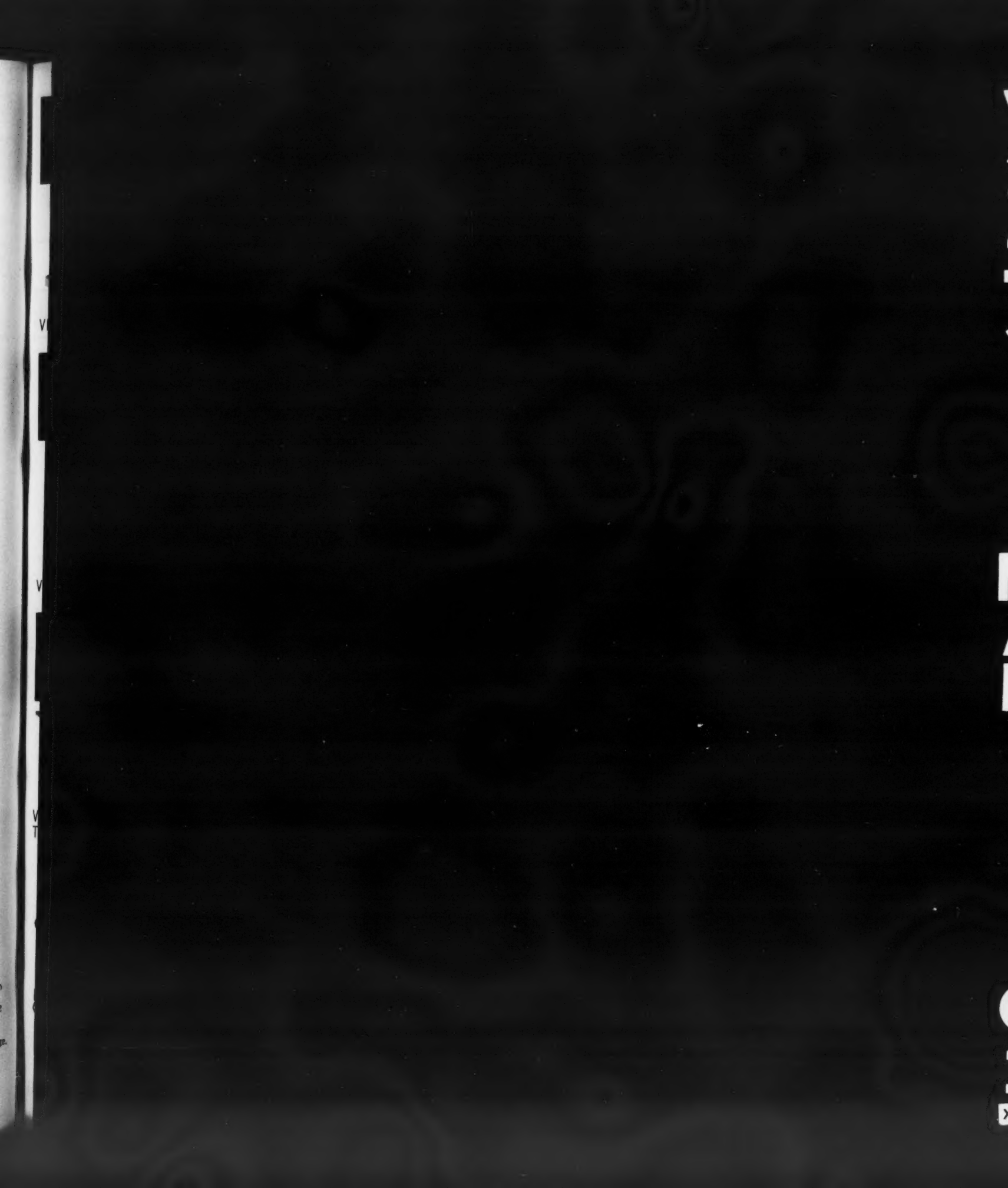

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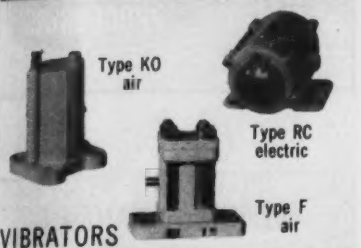

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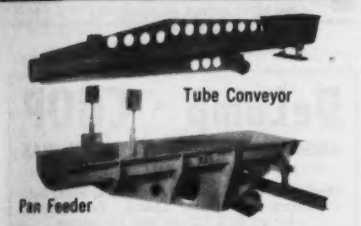

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Check 3221 opposite last page.

CURRENT LITERATURE

Safety

Protective breathing equipment is taken up in a bulletin including information on demand respirators, masks and other types of breathing apparatus. Breathing Equipment Bul—Scott Aviation Corporation.

Check 3194 opposite last page.

Safety, oily waste and plunger cans are presented in publication of Justrite Manufacturing Company.

Check 3195 opposite last page.

Exhausting welding fumes or foul air from enclosed vessels is job of units described in Ventilator-exhausters Bul—Coppus Engineering Corp.

Check 3196 opposite last page.

Material Handling and Packaging

Dumpers, which can handle drums, barrels, bags, boxes and trucks are considered in Cat A-7—Conveyors & Dumpers, Inc., Division of Mercury Industries, Inc.

Check 3197 opposite last page.

Load-Cell weighing systems are expanded upon in four-page Bul 160—Marcan Products Corporation.

Check 3198 opposite last page.

Vibratory feeders are powered by electromagnetic drives. They are available for floor or suspension mounting with flat pan or tubular trough in sizes to meet every feeding requirement. They are considered in Vibratory Feeders Cat—Syntron Company.

Check 3199 opposite last page.

For more information on developments in this section, check the Reader Service Slip.

Vibration inducers designed to move materials out of hoppers, down chutes and through screens are listed in Vibrolator Cat—Martin Engineering Company.

Check 3200 opposite last page.

Tubular conveyors which are self-supporting and self-cleaning are listed in bulletin put out by Conveyor Division, Hapman Corporation.

Check 3201 opposite last page.

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CURRENT LITERATURE

Valve-bag packer incorporates motorized bag shaker. It is further explained in Airpac Bag Packer Bul —E. D. Coddington Mfg. Co.

Check 3204 opposite last page.

Closed-belt conveyor-elevators are capable of transporting bulk materials in any plane to considerable heights and around obstructions. They are specified in Bul 349—Engineering Division, Stephens-Adamson Mfg. Co.

Check 3205 opposite last page.

Vertical and horizontal pumps are depicted in Buls V-837 and C-355, respectively—Taber Pump Co.

Check 3206 opposite last page.

Pumps

Centrifugal pumps have capacities to 600 gpm for heads to 180'. Pedestal assemblies are available for base-mounted coupling connections. Line is presented in Bul P-3c—Ampco Metal, Inc.

Check 3207 opposite last page.

Progressing-cavity pumps can handle suspended solids up to 1-⅛" in diam without crushing, foaming or aerating. They are available in capacities to 500 gpm for pressures to 1000 psi and are topic of Bul 100-CP—Robbins & Meyers, Inc.

Check 3208 opposite last page.

Vertical pumps for follow up of fluids are taken up in bulletin available from Johnston Pump Company, Division of The Youngstown Sheet and Tube Company.

Check 3209 opposite last page.

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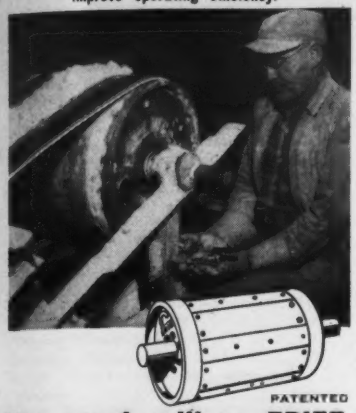

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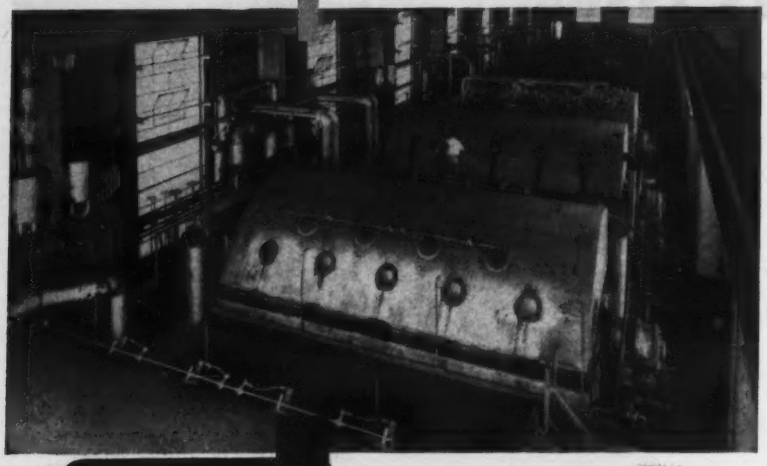

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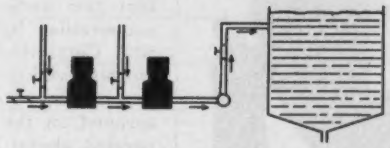

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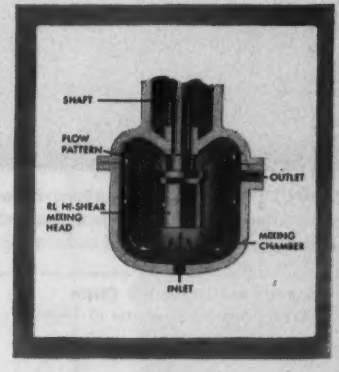
- **ELIMINATE COSTLY EQUIPMENT:** Incorporating the same design principle as the portable SHEAR-FLOW, the new continuous mixer is capable of mixing any liquid that can be pumped, with results better than or comparable to that of equipment costing considerably more.
- **VERSATILE ADAPTABILITY:** More than one unit can be installed in series or in tandem along the route of flow. The new continuous SHEAR-FLOW can also be mounted either vertically or horizontally.
- **HI-SHEAR HEAD:** The unique Hi-Shear Head with dual impellers and stationary stators creates a high turbulence and concentrated shearing action that results in finer, faster blending, homogenizing, emulsifying or dispersing. Mechanical shear is achieved through close tolerances between impellers and stators.
- **SIZE RANGE:** The new SHEAR-FLOW can be powered with motors ranging from 1 to 10 horsepower depending on the power requirement demanded by the application.



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GABB SPECIAL PRODUCTS INC.
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COPPUS BLOWERS

Check 3215 opposite last page.

that's interesting

Chemical blankets on lakes urged to conserve water

Water can be conserved practically and economically by covering reservoirs and lakes with blankets of chemicals, Dr. Victor K. La Mer, Columbia University chemistry professor, contends.

Experiments in Australia and the western U.S. have shown that this method can reduce evaporation by as much as 50%. Cetyl alcohol and stearyl alcohol (waxy-like solids) are ground into a powder and sprayed on the water or suspended above it and dripped on the surface. This dust spreads quickly over the surface to a thickness of about one-millionth of an inch.

The compounds, according to Dr. LaMer, will not get into the drinking water in appreciable amounts and will not harm fish or marine life.

What is bad taste? MCA study hopes to find out

What is "bad" taste or odor, so far as water is concerned, is the problem to be tackled by Franklin Institute, Philadelphia, under sponsorship of the Manufacturing Chemists Association.

First aim of the project will be to find some reproducible method for measuring the intensity of an odor. Later researchers will attempt to set up a system for labeling odors, thus providing common terms of reference.

The program, for which a special, air-conditioned panel testing laboratory is being built, is part of an over-all effort by the MCA Water Pollution Abatement Committee to accumulate meaningful and useful information for anyone interested in water pollution control.

For more information on developments in this section, check the Reader Service Slip.

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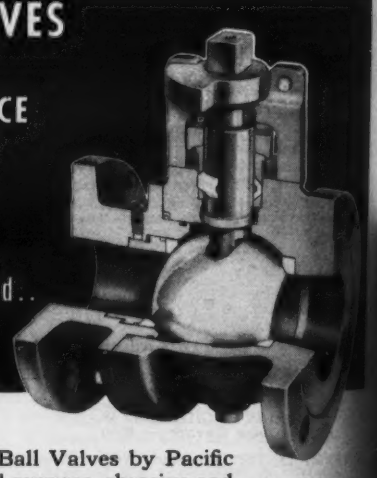

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☐ 2828	☐ 2857	☐ 2886	☐ 2915	☐ 2944	☐ 2973	☐ 3002	☐ 3031
☐ 2829	☐ 2858	☐ 2887	☐ 2916	☐ 2945	☐ 2974	☐ 3003*	☐ 3032
☐ 2830	☐ 2859	☐ 2888	☐ 2917*	☐ 2946	☐ 2975	☐ 3004	☐ 3033*
☐ 2831	☐ 2860	☐ 2889	☐ 2918	☐ 2947	☐ 2976	☐ 3005	☐ 3034
☐ 2832	☐ 2861	☐ 2890	☐ 2919	☐ 2948	☐ 2977	☐ 3006	☐ 3035
☐ 2833	☐ 2862	☐ 2891	☐ 2920	☐ 2949	☐ 2978	☐ 3007	☐ 3036
☐ 2834	☐ 2863	☐ 2892	☐ 2921	☐ 2950	☐ 2979	☐ 3008	☐ 3037
☐ 2835	☐ 2864	☐ 2893*	☐ 2922	☐ 2951	☐ 2980	☐ 3009	☐ 3038
☐ 2836	☐ 2865*	☐ 2894	☐ 2923	☐ 2952	☐ 2981	☐ 3010	☐ 3039
☐ 2837	☐ 2866	☐ 2895	☐ 2924	☐ 2953	☐ 2982	☐ 3011	☐ 3040
☐ 2838	☐ 2867	☐ 2896	☐ 2925	☐ 2954	☐ 2983	☐ 3012	☐ 3041
☐ 2839	☐ 2868*	☐ 2897	☐ 2926	☐ 2955*	☐ 2984	☐ 3013	☐ 3042
☐ 2840	☐ 2869	☐ 2898	☐ 2927	☐ 2956	☐ 2985	☐ 3014	☐ 3043
☐ 2841	☐ 2870	☐ 2899	☐ 2928	☐ 2957	☐ 2986	☐ 3015	☐ 3044
☐ 2842	☐ 2871	☐ 2900*	☐ 2929	☐ 2958	☐ 2987	☐ 3016	☐ 3045
☐ 2843	☐ 2872*	☐ 2901*	☐ 2930	☐ 2959	☐ 2988	☐ 3017*	☐ 3046
☐ 2844	☐ 2873	☐ 2902	☐ 2931	☐ 2960*	☐ 2989	☐ 3018	☐ 3047
☐ 2845	☐ 2874	☐ 2903	☐ 2932	☐ 2961	☐ 2990	☐ 3019	☐ 3048*
☐ 2846	☐ 2875	☐ 2904*	☐ 2933	☐ 2962	☐ 2991*	☐ 3020	☐ 3049
☐ 2847*	☐ 2876*	☐ 2905	☐ 2934	☐ 2963	☐ 2992	☐ 3021	☐ 3050
☐ 2848	☐ 2877	☐ 2906	☐ 2935*	☐ 2964	☐ 2993	☐ 3022	☐ 3051

B

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See additional numbers on reverse side ▷

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Continued from reverse side of this sheet

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*ON ALL NUMBERS HAVING AN ASTERISK (*) after them, please identify the exact product or piece of literature in one of the blank columns on this and previous page. Write in the key number, as given on the slip, followed by the bulletin number (or title), or name of product in which you are interested.

Key No.	Description

(This request form expires June 5, 1961)

Use this space for writing in specific literature or product designation when you check a number with an asterisk (*) in accompanying list. Repeat the key number from that list, and follow it with specific bulletin number (or title), or product name, as it appears in article or advertisement. PLEASE TYPE OR PRINT.

Key No.	Description

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☐ 3052	☐ 3073	☐ 3094	☐ 3115	☐ 3136	☐ 3157	☐ 3178*	☐ 3199
☐ 3053	☐ 3074	☐ 3095	☐ 3116*	☐ 3137	☐ 3158	☐ 3179	☐ 3200
☐ 3054*	☐ 3075	☐ 3096	☐ 3117	☐ 3138	☐ 3159	☐ 3180	☐ 3201
☐ 3055	☐ 3076	☐ 3097	☐ 3118	☐ 3139	☐ 3160	☐ 3181	☐ 3202
☐ 3056	☐ 3077	☐ 3098	☐ 3119	☐ 3140	☐ 3161	☐ 3182	☐ 3203
☐ 3057	☐ 3078	☐ 3099	☐ 3120	☐ 3141	☐ 3162	☐ 3183	☐ 3204
☐ 3058	☐ 3079	☐ 3100	☐ 3121	☐ 3142	☐ 3163	☐ 3184	☐ 3205
☐ 3059	☐ 3080	☐ 3101	☐ 3122	☐ 3143	☐ 3164	☐ 3185	☐ 3206*
☐ 3060	☐ 3081	☐ 3102	☐ 3123	☐ 3144	☐ 3165	☐ 3186	☐ 3207
☐ 3061	☐ 3082	☐ 3103*	☐ 3124	☐ 3145	☐ 3166	☐ 3187*	☐ 3208
☐ 3062	☐ 3083	☐ 3104	☐ 3125	☐ 3146	☐ 3167*	☐ 3188	☐ 3209
☐ 3063	☐ 3084	☐ 3105	☐ 3126	☐ 3147	☐ 3168	☐ 3189	☐ 3210
☐ 3064	☐ 3085	☐ 3106	☐ 3127	☐ 3148	☐ 3169	☐ 3190	☐ 3211
☐ 3065	☐ 3086	☐ 3107	☐ 3128	☐ 3149	☐ 3170	☐ 3191	☐ 3212
☐ 3066	☐ 3087	☐ 3108	☐ 3129	☐ 3150	☐ 3171*	☐ 3192	☐ 3213
☐ 3067	☐ 3088	☐ 3109	☐ 3130	☐ 3151	☐ 3172	☐ 3193	☐ 3214
☐ 3068	☐ 3089	☐ 3110	☐ 3131	☐ 3152	☐ 3173	☐ 3194	☐ 3215
☐ 3069	☐ 3090*	☐ 3111	☐ 3132	☐ 3153	☐ 3174	☐ 3195	☐ 3216
☐ 3070	☐ 3091	☐ 3112	☐ 3133	☐ 3154	☐ 3175	☐ 3196	☐ 3217
☐ 3071	☐ 3092	☐ 3113	☐ 3134	☐ 3155	☐ 3176	☐ 3197	☐ 3218
☐ 3072	☐ 3093	☐ 3114	☐ 3135	☐ 3156	☐ 3177	☐ 3198	☐ 3219
							☐ 3220
							☐ 3221*

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If the oil industry were to collect this year's gasoline taxes in kind, it would have to turn over to state and federal governments about 27 billion gal of gasoline, D. W. Ramsey, vice-president of Humble Oil and Refining Co., estimates.

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Final preparations are being made 25 miles south of Carlsbad, N.M., for the salting away of a nuclear bomb. Technicians are tunneling through salt deposits 1216′ below the desert surface in preparation for the Project Gnome explosion sometime this year. A presidential okay is needed for the shot.

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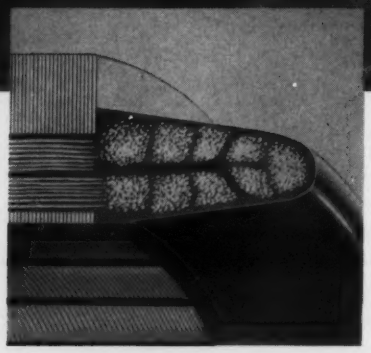

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